

# AVIATION WEEK

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JUNE 18, 1951

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## 4 hot ideas for fighting ice

**The pipe that flies like a plane.**

During a new flying boom for in-flight refueling (upper left) is usually done two place by means of two shaped refueling. To provide accurate control, these refuelers had to be precision ground. So B. F. Goodrich developed special electric rubber parts for the leading edge refueling supply pipe containing heat.

**Electric blowers keep new Arctic plane from freezing.** Designed for Arctic work, Northrop's new G-119 (upper right) had to have ice protection as all wind upon BFG electric rubber "blowers" forced the thick, fast-draw pump—seasons later, eleven hours and six days. Because of the design flexibility of electric rubber, wide varia-

tion in the shape of these three parts proved no obstacle.

**Keeps ice from choking jet's throat.** Ice forming in the narrow "throat" of a jet engine intake could choke off the air supply, make the engine quit cold. This threat has been eliminated on North America's B-47 (lower left) with a special lining of BFG electric rubber inside the throat.

**Rubber makes gasoline stick.** To help flight engineers adjust fuel supply for maximum efficiency, a hydrocarbon line transmits propeller fuel to an automatic fuel control. But this was confusing the fuel, causing false readings. BFG engineers sheathed the hydrocarbon line in electric rubber to keep

the oil fluid, sure gasoline. This heated line is now installed on TWA Constellation (lower right).

B. F. Goodrich electric rubber is tough, this rubber with a coat of resistance when that gasoline spot heat precisely as needed. This lead was attached to the engine's regular power supply as the only other voltage required. Electric rubber can be made in any size, any shape, explain you. For help with your problems write to The B. F. Goodrich Company, Akron, Ohio.

**B.F. Goodrich**  
FIRST IN RUBBER



## DOMESTIC

North American Aviation delivered its 45,000th military plane, a P-38C Sabre, to the USAF on June 7. The company's first plane, delivered to the Air Corps in 1936, was a BT-9 basic trainer. During World War II, NAA manufactured 14 percent of all planes built in the U.S.; has delivered about 3,000 planes since Apr. 1, 1945. Its total includes 16,428 fighters, 18,979 bombers and 17,276 trainers.

American and United Air Lines' pilots will add 10 day working periods and be free to strike on June 14. UAL employees notified company on May 26 that they may strike, following breakdown of negotiations. The 10-day period also begins for AA pilots the same day, when Presidential Emergency Board handed down its recommendations in the AA pilot dispute. Pilots say there hasn't been a general pay increase since 1945.

Albert Henry Ness, a former vice president of the National Aeronautics Assn., died May 27. He was 54 years old.

Tycofuse, Inc., will begin deliveries in about 90 days on its first plane, T-6, to cost \$5,590. PAF, Corvay, Pa. The plane will be fitted with a 145-hp Continental six-cylinder engine, cruise at 115 mph, have a normal range of 390 mi., and carry a useful load of 925 lb.

Regent Kocher 250 four-place all-metal executive plane (American West Apr. 20), is making a tour of military installations to demonstrate the plane's capabilities. The steamer vessel Wright Field, Washington, D.C., for Navy inspection, and Ft. Bragg, the Army Field Force evaluation.

Local aviation activities, Pacific University, Lafayette, Ind., June 21-22, will have all five members of CAB, and the Administrator and Deputy Administrator of CAA present. Other items on the agenda: local air service to smaller towns, and particularly in the Midwest airports, sales, aerial for local service, economics, airport and landing aids.

CAB Executive R. Vernon announced National Airlines to open CAB permission to operate daylight DC-6 flights, New York to Miami, with proposed \$15 one-way fare, compared with \$55 night coach, \$75 regular fare.

and off-peak 16-day excursion air one way cost of \$57. RAL, operates the service, but says it will start competitive daylight coach flights with Canadian trans if the NAL flight is approved.

Col. J. Francis Taylor, Jr., USAF Air Weather Flap Division chief, Wright-Patterson AFB, won the 1950 biplane phase of the Corporate Aircraft Design Assn. for his work in developing all-weather navigation aids and instruments, maintaining, to safety and ability of all forms of air transport.

## FINANCIAL

Gayett Corp. reports preliminary consolidated net profit of \$1,195,572 after federal income taxes for the nine months ended Mar. 31. Gross revenues for the period were \$21,661,315. A 44-cent-per-share quarterly dividend was announced payable June 20 to holders of record on June 1. Headquartered at Alexandria, Va., Gayett is engaged in about 500 million.

## INTERNATIONAL

Gro. P. Pavesi-Papaglia of Italy was elected president of the 4th assembly of the International Civil Aviation Organization at Montreal. Nominee in vice president was Dr. Enrique M. Lozano, Mexico, Sphing Dordrecht, Thailand, L. T. Lutz, South Africa, and K. G. Holmstrom of Sweden.

Scheduled regular airline service to Britain was begun June 1 by British European Airways Corp. using Westland-Sikorsky S-51s between London and Birmingham.

First of about 100 USAF North American T-6 trainers are arriving at RCAF training bases on loan for training at Canadian and North Atlantic Treaty Nations aviation. These planes will be used while Canadian production of the T-6 gets underway at Canadian Car & Foundry's Ft. William, Ont., plant, which made T-6s during the last war. Ft. William is expected to turn out 1,000 T-6s.

Trans-Canada Airlines showed an overall deficit in 1950 operations of \$3,313,205, against \$4,317,393 in 1949, with domestic operations coming out of the red for the first time since 1945 with a profit of \$281,206. Trans-Atlantic operations showed a \$1,535,432 deficit compared with \$2,694,149 loss in 1949.

## Load-sensitive ROTORette



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... IT'S A JET PLANE

"... THE FIRST AIRCRAFT IN THE WORLD TO HAVE FLOWN PISTON POWERED, JET POWERED, OR AS A GLIDER ..."  
(AVIATION WEEK MAGAZINE APRIL 30, 1951)



## SIDELIGHTS

### Air Force

Secretary Pellerin last week was inspecting Pacific air bases and conferring with PACAF commanders in Tokyo on status of equipment. Nels Lenzarben, Deputy Director of Public Relations, was on his party. An *Metrol* Command is testing a jet-fueled Hopper engine which can be installed in a day and two reconnaissance jets get lighter. Pioneer function in its reconnaissance last points to heavy scheme during air war. *Huel Highland Farm Inn, Sullivan Point, N. C.*, near Ft. Bragg, has been leased by AF, expanding its air command operations school at Pope AFB. The airport will enable Tactical Air Command to graduate about 5,000 Army, Navy & AF students per year.

### Air Transport

Eastern Air Lines was high bidder on CAA's second C-54, at about \$915,000, and will not sell it to another carrier, despite reports. TWA, this purchased a second C-54, fully converted, for about \$121,000. Such is the shortage of transports these days. Southwest is drafting the rules of its 25-year pact to include a 10-year anniversary program. It especially suits the three original States Division that started its service in 1936. It has no idea but has been laid on a former NWA, said by carrier in Alaska, an open-circuit job during western trips and the first NWA, DC-1, which is reported in South America. Northwest Alaska Service, carrier, Air Transport Association, will fight the Alaska across one division of CAA, as modeled by Pan Am's Transcon. Its previous, Alaska Airways, who is also president of the company, now will take the case to CAA and the courts of services.

### They Come & Go at CAA

Marion Ross is named executive assistant to CAA Administrator Charles F. Horne, taking the post vacated since resignation of Edward M. Sullivan. Ross formerly was assistant to Ross' successor, executive assistant to Commissioner John Allan, C. W. Whitney, and Thomas W. S. Davis. R. C. Stenck is named chief of the Technical Staff Division of the Office of Aviation Safety, succeeding John F. Warlick, an active duty as a major in USAF. Lt. Col. E. F. Freder, former chief of the General Flight Branch of Flight Operations Division, has gone to MATS, and is succeeded by W. B. Spencer. The division also lost Lt. Col. John Rodgers, chief of special operations, succeeded by R. O. Roush, and Maj. Gordon Borden, a flight operations specialist, both to USAF. In the Aircraft Division, Lt. Col. Joseph Roush, with CAA since 1975, goes on active duty with USAF in Washington. Lt. Col. John Gaskin, who left his post as deputy chief of America's Division to go on active duty at Kelly Field, International Airport, lost Lt. Col. Richard Schell and Col. C. E. Taylor. (Continued on page 85)



ALLIGATOR was holed by Red fire which chewed a considerable part of the surface out, but didn't slow the plane.



FLAF took a direct hit by a shell and the fuselage was also stitched by smaller enemy fire during a striking run.

## How Thunderjets Fare Under Fire



COMBUSTION CHAMBER (above) was punctured by 50-cal. slug, which also damaged 115% ducting and turbine wheel, but did not cripple engine.



HORIZONTAL STABILIZER and elevator (below) were nearly swept away by a shell hit. Pilot ejected plane "black a hole".

EXHAUST CONE (below) was thoroughly "holed" by Red machine gun fire, exhaust fire also stood up to a heavy hit.

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100-4

## WHO'S WHERE

### In the Front Office

Wilhelm Schwesens has been made vice president manufacturing of Schweizer Aircraft Corp., Elmhurst, N. Y. Younger brother of Ernst Schwesens, president, said Paul Schwesens, vice president general manager. Wilhelm was production manager of the company from 1941-1946 and returned after serving for several years as the chief of Long Island Agricultural and Technical Institute.

Robert N. Horowitz has been designated vice president controller of Colonial Aircraft Horowitz, who has been in the oil industry for over 35 years, is a member of the Acheson Finance and Accounting Committee and the American Association of Accountants. He, similar to business moves, the career moved to Oilville, Ohio, where he was deputy secretary. Horowitz was formerly chief of the treasury section, Bureau of Air Operations, CNA, which department he joined in 1949.

### Changes

A. A. Boebing, former secretary, has moved from World Aerospace, which publishes *Jet* as production manager. I. Keith Gerzelle has been appointed Kaiser-Patterson secretary at Wright Field. Robert C. Budo has been made manager of the Aircraft Products division of Babcock, Inc., Calver City, Calif.

Samuel Leptin has joined newly formed Coastal Aviation & Marine Corp., New Arthur Airport, New York to handle the firm's sales and service department.

Arthur L. Rudolph has been named assistant manager of the Ford division of Wm. B. Whitford Co. Ltd. Owen E. Mould has been made manufacturing manager of Lorch Sherry, formerly was production plant which is to build the Whiting 340 jet for the Navy. R. E. Boney will be chief engineer on the 140 page and H. F. Roberts has been named engineering agent.

Wesley L. Duncan has been designated superintendent of machine sales and development for Mid-Continent Airlines, St. Louis. L. C. Gales has been named general manager of Robinson Aircraft Ltd., subsidiary at BOMAC.

G. Berry Miller has been appointed as president of inspection for Eastern Air Lines. George M. Monaghan has been made maintenance superintendent for the Flying Tiger Line as military and foreign government contracts. Paul K. Wozniak has been designated supervisor of inspection for Northwest Airlines.

Hugo R. May has been designated North American manager for Svenska. James A. Bunker has been named representative of aircraft engineering for Northwest Airlines at St. Paul and William M. Thomas has been made supervisor of performance engineering.

Robert J. Laff, Jr. has been appointed director of passenger sales for American Airlines entire system of operations.

## INDUSTRY OBSERVER

One of the latest combat intelligence operations of the Korean struggle was involved in the gathering of wreckage of a Russian MIG 15 plane shot down over Korea by USAF F-86 fighters (Aviation Week June 11). Helicopters were flown to the crash to gather parts and wreckage, and two days back behind sea lanes, for transfer to a larger plane for removal to Tokyo. Here the parts were fine-grained for analyzing intelligence. Beneficial patterns undoubtedly on the engine, and inspection of improvements which give the Next development high performance with jet water injection or afterburners, was a revelation to the USAF engineers who examined the material. Statement of USAF spokesman that USAF has not yet captured a MIG 15 or one of its engines (Aviation Week June 11) apparently referred to a complete engine and complete engine.

Lockheed Ventura bombers of World War II are coming back into the service plane and out after a recent CAA extension of KL licensing requirements for the plane. The bulk acquisition is becoming a Ventura over from Europe after preliminary overhaul at a KL base in Holland.

Ford Aircraft Engine division, Chicago, expects to have parts completed by Nov. 1 for the last Pratt & Whitney R-422 engine to be built at Chicago. Ford is pushing to complete the engine within 60 days afterward. It is planned that the Chicago plant will build 235 of the 3,140 different parts for the three different dash number models of the R-422 which Ford has contracted to make. Other parts will be built by the Ford Rouge plant, Ford Cincinnati plant, and thousands of subcontractors on the engine.

Going pace on the used plane market for Douglas DC-3s is fairly good condition, where one of the more items can be found, is now reported at between \$85,000 and \$100,000, as most the replace sold for brand new.

Gleason L. Martin Co. has already offered technical and engineering service to Transwestern Air Lines in connection with the new Martin 2-22s which TAI has issued from Northwest Airlines for transcontinental service. The Martin company is planning to supply the technical services and spare available in other 2-22 aircraft which make service flying arrangements with Northwest.

The new Hines Aircraft Corp. project to overhaul and modify North American B-25 bombers as modern and executive transports for the Air Force at the 3.5-million ap. B. Modification modification cost probably will be only the first in a series of contracts to the new company. Harry T. Rosenthal, Hines president and general manager, was formerly executive vice president of the Gleason L. Martin Co., Hines Aircraft Corp. is a subsidiary of Hines Manufacturing Corp., Grand Rapids, an automotive company.

Gleason L. Martin Co. expects to get the first production 604-B in the air at Middle River Airport, Md., by the end of June.

Army spokesmen recently told Congress that they were pushing ahead the Nike ground-to-air guided missile project, that Western Electric Co. has allotted \$15 million to test for production of the missile, and that another \$15 million was going for a firm not yet determined, to manufacture the projectile for this missile.

First all-Canadian jet pilot, the Aero Canada CP-100 Canard, powered with two Aero Canada Orndorff engines, is now being ground for its first flight. Production models of the night fighter will be powered with the Orndorff. Earlier pre-production models at the plant line and two Bell Helicopter Model 400 engines. Orndorff has previously been flight tested in a Lancaster flying tank bed and is a North American F-86 Sabre jet fighter.

## Washington Roundup

### Sherman's Outlook

Chief of Naval Operations, Adm. Forrest Sherman, when only one flat prediction on the future of military strategy and the capabilities of the armed services. The trend toward more and more emphasis on air power, both carrier and land-based, will go on indefinitely.

Beyond that, there are too many "ifs" in the picture for flat predictions. The years since the 1911 Bureau Act seem that fast, and Sherman's interest in aviation, he says, have taught him not to make predictions.

The Navy's chief made these points in an exclusive interview with AVIATION WEEK.

• **Land-based tactical air is losing mobility.** Its role is becoming "more and more restricted." Bombers, fighters, attack and transport planes require elaborate support facilities; they're difficult to operate from mobile-draft fields of World War II. This could mean increasing use of the carrier as the ideal site for tactical air.

• **Strategic bombing's days are not numbered.** Development of guided missiles and piston aircraft "would tend to reduce" the role of the strategic bomber in about 10 years. On the other hand, complementary use of piloted and piston aircraft could add to the role of strategic bombing.

• **Aircraft carrier is not likely to replace battleship as support for ground operations.** Army's Chief of Staff, Gen. Lesley H. Brown, thinks it might.

• **Sherman says aircraft carrier and personnel will probably be used from places in advanced tactical air operations, and from the ground in close operations.**

• **Lightship is not likely to be used by the military for transport, unless and until it proves itself commercially.** In a few "special cases," Navy does utilize its ships for transport work.

• **Battleships, the backbone of the pre-World War II Navy, now seem to be permanently adopted for their present military applications: anti-aircraft, anti-submarine, anti-aircraft, anti-aircraft for fleet command, anti-aircraft, anti-aircraft.**

### Bigger Navy?

Adm. Sherman hints that before long he may bid for a bigger naval expansion.

Of the three services, Navy's build-up is markedly the most modest.

• **The 1946 National Defense program that provided the Johnson "emergency" request called for a 12 Division Army, 70 Group Air Force, a Security Group Navy of 18,700 operating planes.**

• **It is not planned to shoot Army strength up to 15 divisions and USAF strength to 55 wing units this year.** The Navy's build-up will be to 16 air carrier groups and 5,600 operating aircraft.

• **That's why there was some surprise when Shermans emerged at recent Senate hearings as the only completely satisfied member of the Joint Chiefs of Staff.** USAF's Vandenberg, urged a much "bigger and better" air build-up. Army's Collins took a middle road position, just a little more gain, perhaps.

The key difference between the Shermans and Vandenberg positions seems to be "how fast" rather than "how big." Shermans cherishes his brand.

• **How Fast?**—I have never stated that I do or want a

bigger Navy than now planned. I think that ought to be covered before long.

• **How Fast?**—When I testified that 'certainly with respect to air the cost of building is as rapid as can be accomplished with efficiency,' I referred to the Navy as well as the Air Force program. And, by the statement, I did not prejudice myself against a 150- or 200-wing program the Air Force might present, nor against a larger Navy air arm.

Sherman summed up: "In our build-up I want to maintain quality and combat readiness while growing. Also, to keep military operations above increase the level of administration and standards."

### Why Navy Gets Less Money

The postwar trend toward giving Navy a smaller and smaller share of the defense budget doesn't mean the Navy is becoming, comparatively, a weaker and weaker arm of the defense, Shermans explains.

Navy, which used to get a 40 percent share of the defense budget in the first postwar years, now gets only 25 percent.

Sherman's point: The Navy has been able to do more for less money than the other two services because:

• **It is using savings-up savings.** When the Navy launches a new carrier construction program, the money trend will change. Ships are the big cost item in Navy budgets.

• **Navy has put emphasis on strengthening its reserve forces—what cost less to maintain than full-time active forces.** Army and USAF have been handicapped on this score because they do not have the direct control over reserve components the Navy does.

### That "Pearl Harbor" Fleet

Navy, it seems to shrewdly, was putting on its "pearl" front last October when it landed on Congress' desk and asked Shermans for construction of the new 57,000 ton carrier, to be called the *Franklin*.

Sherman compared a 5,600 plane Navy now programmed with a 5,243-plane "Pearl Harbor" arm. Congressmen promptly demanded the President's construction to reinforce the "Pearl Harbor" Navy air arm.

But it appears the 5,243-unit included every plane in the Navy on Pearl Harbor day—from "greenhorns" types on up. The current program involves 5,491 "battleline" operating aircraft—exclusive of a strong reserve force.

Sherman suggests it would be more accurate to compare the 5,243-plane "Pearl Harbor" force with 13,000 total aircraft inventory of today's Navy.

### Here and There

• **National Security Resources Board-NRBE** is being strengthened. But it will be strictly an advisory agency, weighing problems and solutions from the long-range perspective for use by Defense and other government operating departments and agencies in drawing up their short-range programs. The President wants W. Averell Harriman, now foreign affairs adviser, to take over the NRBE chairmanship. Jack C. Davis, acting chairman, isn't likely to be named. He holds strong political opinions.

• **Navy Plans—**Sherry will have around \$400 million more to spend on its facilities expansion program in 1952 as the budget for the 1952 fiscal year, which starts July 1, is approved.

—Katherine Johnson

# AVIATION WEEK

JUNE 16, 1951



Vandenberg



Twining

## Vandenberg Expected to Step Out Soon

Twining seen as likely successor; other command changes hint at policy shift.

Reports that Gen. Hoyt S. Vandenberg, 57, will resign June 16 as USAF Chief of Staff were met with surprise in Washington last week. Several reliable sources informed AVIATION WEEK that his resignation was announced, although close associates of the general professed to have no knowledge of it.

Vandenberg himself was in Paris and could not be reached. He was attending a meeting of chiefs of staff of the North Atlantic Treaty countries. But the consensus was that the personal reason for his resignation at this time would be an after effect of private industry.

Possibility of sweeping policy changes in basic air combat planning is frowned in some quarters.

• **Very Likely Candidates—**Gen. Nathan Twining, 55, now Vice Chief of Staff, USAF, and Lt. Gen. LeMay, 44, Chief of Staff, U. S. Air Force in Europe, and commander of Allied Air Force, Central Europe, are regarded as most likely candidates for successor to the top Air Force post.

Twining, fourth-ranking Air Force officer in seniority, formerly was commander of the Alaska Commanded Defense Command, commanding general

of the Air Materiel Command and as now Vice Chief of Staff. During World War II he was named commander of aircraft in the Solomon (Pacific) and later became commanding general of the 12th Air Force in 1944. Some quarters believe his appointment to Vandenberg would be logical as a first test of duty before retirement. He has put in 33 years of active service—three years longer than is needed for full retirement pay.

Natural, at 44, is considered to be one of the most brilliant air leaders and strategists this nation has produced and is obviously being groomed to assume the office of Chief of Staff. But, last year, when the post of Vice Chief of Staff became vacant with the death of General Mark S. Purnell, Twining, although he was prominently mentioned for the job, was passed over after a brief term as Acting Vice Chief because of his lack of executive administrative experience.

• **Retirement Speculation—**Considerable speculation that Vandenberg would retire has been because of recent remarks made by him. He said that while his term of duty as Chief of Staff would be completed in April 1952, he still needed two more years service to be eligible for full retirement. Sources close to Vandenberg recently declared that he had



Nathan

been offered many attractive executive positions in private industry but that he would give consideration to none until the retirement date was crystallized. One source also indicated that Vandenberg would retire soon (AVIATION WEEK June 4).

Top civilian Air Force officials are particularly disturbed because of imminent retirement of many other top ranking USAF officers, during the next 15 months. Many are reaching retirement age almost simultaneously due to the fact that all civilian service with Signal Corps Aviation Section and later the Army Air Corps at short duty units was





## Plane Whose Wings Change Sweep in Air:



## New Bell X-5

Bell's X-5 research aircraft, designed to explore the effects of sweeping configurations in transonic flight, will enter the first phase of its flight program soon at Edwards AFB, Mono, Calif.

General features of the X-5 is its wing design, an arrangement permitting the sweep angle to be varied in flight. The design of the X-5 represents the result of research and development by the team of Air Force, Bell Aircraft Corp., and the National Advisory Committee for Aeronautics.

**■ Dimensions:** Data—The size of the X-5 puts it in the same class with Bell's X-1, rocket-powered research craft. The X-5 has a wingspan of 32 ft. 9 in. (on assembly in the fully-spread position). Length is 51 ft. 4 in., and height to tip of fin is 12 ft. 6 in. Gross weight is given as approximately 10,000 lb.

Powerplant of the X-5 is the Allison J-35-A-17 turbojet engine, rated at 4,300 lb. sea level static thrust.

Basic layout of the X-5 calls for several research aircraft proposals made by Messerschmitt, in Germany, during the early months of 1945. One, the P-1101, had wings that were variable in the ground but not in flight. The X-5 mounts the engine in the fuselage belly, in this manner, inlet duct losses can be maintained because of the short length the air must travel to get to the engine inlet.

The plane has high and forward, but is located behind main above the engine. Space is provided between fuel and engine to house the exhaust root section of the wing when the sweep angle is at its greatest value.

**■ Wing Details:** The wing of the X-5 is pivoted about a vertical axis at intersection of fuselage and wing root. The exhaust portion of the leading edge has been built in the form of a curved arc, it slides under a hinge fixed to the fuselage. (See bottom photos.)

The trailing edge retracted section of the wing is also hinged in an arc, aft of this arc section is what appears to be a flap. Adams claim to narrow span is about 50 percent of the wingspan. Slits are fitted to the leading edge of the wing.

Conventional, sweptback tail surfaces are mounted on a boom extension of the main fuselage. A small control fin is fitted to the underside of the fuselage boom.

Landing gear of the X-5 is tricycle, with nose gear of pivot type. Main wheels for straight and retract up and down into the fuselage.

Two brakes are mounted on the fuselage forward of the cockpit. They can be opened hydraulically and are perpendicular to the fuselage axis.



## GE Reveals More Powerful J-47s

A new version of the J-47 jet engine, the J-47-GE-21, has added greatly increased thrust without increasing the engine's dimensions, General Electric Co. announced last week.

GE said the long-standing phrase "no more of 5,200 lb thrust" is to describe the engine's rating, although that thrust rating has long since been made obsolete by military demands. And, while the engine is probably as powerful in any new being produced, GE claimed being a "most powerful" thrust made for other engines.

**■ Thrust First:** What GE did say was that the J-47-GE-21 will do "at least one for more thrust than the present J-47."

"... increase thrust size of the J-47 but with a thrust output in much greater than it's own in the same class."

About 6,150 lb thrust, being controlled generally has been attributed to the 21's predecessor, the J-47-GE-21. In the light of engine development and GE's know-how this could only be indicated as a conservative value, for the 21 is a completely new concept, having made its debut only last November.

Using the approach as a base for further interpretation in the light of the strong conditions made for the new engine by GE, a company that is usually exceptionally conservative in its claims, the new engine probably is up to that "most powerful" bracket—the 5,200 lb thrust class.

**■ Compressor Vane Factor:** And there is another point to go by. GE has bestowed its highest engine honor—the Clavin Award—on the Aircraft Gas Turbine Division's Randall Hall and William Carroll for development of

the new engine's compressor. GE doesn't say this award should lightly, because the efficiency of the 21's compressor must represent a significant step for attaining higher thrust.

The compressor is described as combining high air flow, high pressure ratio and high efficiency with a minimum number of stages. The 21's basic case contains the case in the previous J-47—30.75 in. in diameter and 146 in. long. Some of the features that formerly were housed in the case have been placed underneath the 21 to provide a greater inlet area to the compressor.

This obviously reduces the case diameter and increases the length of the inlet guide vanes by what appears from photos to be a significant increase over those on the 21.

**■ Other Details:** The new engine leaves plenty a number type of combustion system in the individual case of the earlier J-47s.

Basic engine control system remains hydraulic, exhaust temperature is controlled electrically, and the oil is cooled by engine fuel. There is a "hot" and "cold" and retractable air inlet system.

GE reports the engine to have a "low" rate of fuel consumption.

**■ Model Changes:** It is now established that the J-47 is scheduled to be in the picture for some time to come and will be subjected to continuing development. For the company says that its new 21 is the first of its "advanced J-47" series. Changes are that the J-47 for the new 21 is merely a convenient label. The engine probably incorporates such extensive refinement and design improvements that it represents an essentially different powerplant.

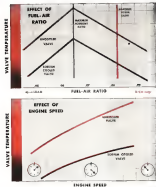


# Why Sodium Cooled Valves?

The trend of modern engines is to operate at higher speed and more economical fuel-air ratio. In considering factors which influence exhaust valve life, temperature is the dominant one. High temperatures sharply reduce the resistance to corrosion, discoloration, and fatigue life of the finest alloy steel. The effectiveness of sodium cooling in reducing valve

temperatures is shown by the curves below, which are typical of recorded test data.

The curve "Effect of Fuel-Air Ratio" shows that as the mixture is leaned out to obtain maximum economy, valve temperatures rise. The curve showing "Effect of Engine Speed" indicates that temperature rises quite rapidly as speed increases.



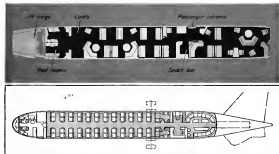
*Eaton engineers will welcome an opportunity to discuss the application of Eaton sodium cooled valves to engines proposed or now in design.*

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LUXURY ALIGHT is the layout of these versions of the Lockheed L-191 (top) and Boeing Model 471 jet transport designs.

you reason which will come at 352 mph, at 15,900 ft.

The company with Boeing quote from 300 mph cruising speed at 40,000 ft. or 500 mph maximum speed with nominal power and 125,000 lb. gross at 40,000 ft. The Boeing design includes three engine compartments, 97 passenger cabin with five abreast seating, and two standard and luxury versions for 40 passengers. The luxury version includes an electric lavatory at the rear compartment in a lounge. Such an accommodation would be used for overnight flights, for example, from San Francisco to Hawaii.

► **Power Plants**—Both Boeing and Lockheed designs presently specify the same powerful turbojet engines that are now in operation. But even if the new jet engines now in development (Pratt and Whitney J-57, Allison J-35-A-3, Westinghouse J-402) give promise of the 30,000 to 35,000 lb thrust needed to achieve the performance calculated for the Model 471 and L-191.

Actually, the Boeing proposal calls for four J-57s, while Lockheed design two in a good wing and one under the B-47 installation now in use.

And the Lockheed proposal has stepped up its power requirements by 10 per cent, calling for four jet engines with static sea level thrust of 12,700 lb. each. These are installed in a cluster at the rear of the fuselage, aft of the passenger cabin.

► **Rearward Runway-Landing** requirements for both planes are obviously aimed at saving existing airports, al-

though the 145-ft. 2-in. open Boeing is expected to show considerable short-landing at 175,900 lb. gross than does the 194-ft. open Lockheed at 165,000-lb. gross, as could be anticipated. The Boeing gets up in 3,950 ft. (dry) on a standard day, but the Lockheed is quoted 5,050 ft. without short-landing, on a standard day. On hot-day take-off, the Lockheed is expected to get off in 5,500 ft. with short-landing.

► **Safety Features**—Critical attention to safety features has been given by the designers of both new planes. Boeing cites safety features such as these: low wing configuration with all fuel stored in outer wing panels, and engine installation. Double pane windows, side exits for use of passenger movement, eight emergency exits, front or rear landing, and engine gas, with dual exhaust throughout. (Same size and type of jet is used in current transports).

Lockheed lists among safety features of the L-191: engine compartment baffles that to control location of engine, power-boost controls, thermal devices in leading edges of wing and tail, engine compartment with fire resistant materials, all fuel stored in wing and engine section tanks, noise in fuselage. (Wingtip tanks will be added for very long-range jet requirements).

► **Maintenance Simplified**—Simplicity of the jet engine as compared to the piston engine, has long been a selling point for a switch to the turboprop. Both American manufacturers have taken full advantage of this simplification in their new designs, and have reduced their for-

ever maintenance in all particulars. Lockheed considers such trouble-free maintenance stems as engine accessibility, with low powerplants side-by-side, under air loadings those with hydraulic and electrical systems easily reached, short engine drains, engine compartments separately for easy removal, simple fuel system and controls connections, accessible from ground level by maintenance personnel, engine controls can flow coolant direct to engine, with no tank into wings and engine nacelles.

Also, underwing refueling to free groups of tanks of approximately equal capacity, pressurized with engine air at normal high flow, bubble-type outer wing tanks, and integral outer wing tanks.

Boeing features easily accessible jet pod repairs, which can be quickly changed if necessary, general design for equipment accessibility, underwing refueling, grouped level accessibility, no evacuation barrier, runway cargo compartments.

► **Passenger Comfort**—One of the important things that both manufacturers have to sell in their new jet transport designs is passenger comfort. The gentle reduced level of vibration in jet aircraft as compared to piston-engine powered planes is a generally recognized fact. Lockheed claims an additional smoothness by its stream-lined, engine installation. "In one of the right seats" of the airplane, just aft of the wing carry-through structure.

Reduced cabin noise level is discussed as another advantage of the Lockheed

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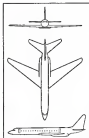


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## LOCKHEED L-193

### Characteristics

Capacity: 10,000 lb., sea level static thrust, average engine  
Wing area: 1,111 sq. ft.  
Spanned tail area: 1,111 sq. ft.  
Vertical tail area: 1,111 sq. ft.  
Overall length: 110 ft. 8 in.  
Wing span: 140 ft.  
Overall height: 40 ft. 4 in.  
St. of passenger: 18-20

### Weights

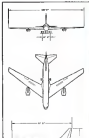
Design takeoff gross weight: 144,000 lb.  
Design landing gross weight: 121,000 lb.  
Wing empty: 74,470 lb.  
Operating weight empty: 77,750 lb.  
Gross load: 70,710 lb.  
Fuel load: 14,000 lb. (5,000 lb. per wing)

### Performance

Max. cruise speed at 20,000 ft.: 470 MPH  
Max. cruise speed at 20,000 ft.: 470 MPH  
Rate of climb at 10,000 ft.: 1,000 ft./min.  
Climb rate at 10,000 ft.: 1,000 ft./min.  
Climb rate at 10,000 ft.: 1,000 ft./min.  
Climb rate at 10,000 ft.: 1,000 ft./min.

Engine mounting which puts the exhaust of the low jet engine 15 ft. behind the rear of the passenger compartment. Other features of the Lockheed L-193:

- Hot for wing and tail decking is provided by compressor of high pressure air sent, plus booster heat from a tail gas heat exchanger.
- Cabin heat is "hot wall" type warmed by hot air from the engine.
- An heated from engine compressor is carried under pressure in an air ducts



## BOEING 473

### Characteristics

Capacity: 10,000 lb., sea level static thrust, average engine  
Wing area: 1,111 sq. ft.  
Spanned tail area: 1,111 sq. ft.  
Vertical tail area: 1,111 sq. ft.  
Overall length: 110 ft. 8 in.  
Wing span: 140 ft.  
Overall height: 40 ft. 4 in.  
St. of passenger: 18-20

### Weights

Design takeoff gross weight: 144,000 lb.  
Design landing gross weight: 121,000 lb.  
Wing empty: 74,470 lb.  
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Engine mounting which puts the exhaust of the low jet engine 15 ft. behind the rear of the passenger compartment. Other features of the Boeing 473:

- Hot for wing and tail decking is provided by compressor of high pressure air sent, plus booster heat from a tail gas heat exchanger.
- Cabin heat is "hot wall" type warmed by hot air from the engine.
- An heated from engine compressor is carried under pressure in an air ducts

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P-16 L-141 Transport engine (shown) is supercharged on fighter aircraft.

being considered as additional features for control at low speeds, for the Lockheed, along with the generally used slotted flaps.

- **Airframe** has nose-down configuration on the ground, raising the engine exhausts at the tail, so that the force of the jet blast would be dissipated, cutting down the restricted area behind the plane in range to about 100 ft.

- **Passenger doors** are at present dry transport height, lower cargo compartment doors only are at above ground.

- **Safety** caught provided by the increased power in such that plane is expected to be able to fly at about 5,000 ft. always with three engines out.

- **Other features** listed for the Lockheed:
  - **Integral** overloading ramp is provided.
  - **Fully pressurized** cargo holds have 700 cu. ft. of usable volume and are easily accessible for hand loading from ground level.

- **Standard** 60 passenger cabin is designed for modification to other interior arrangements without changes to basic airframe structure. Conversion from standard to luxury arrangement involves simply reworking the aft compartment in a lounge, which can be accomplished at any time in the life of each plane. The 97-passenger high-density seating arrangement can be converted from the 60-passenger version merely by rearranging the seats in five blocks.

The Boeing and the Lockheed jet transport proposals are now under power engines, while the Department of Defense makes their further development possible. If development work were started on other prototype today, on a normal commercial timetable it is estimated it would be well over two years before the prototype would fly, and possibly another three years before the airplane could be in transport service in production quantities. But the urgency of military aircraft production has a way of compressing long periods of development and testing.



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And, of course, PAC is the first and largest distributor of Pratt & Whitney Engines parts in the world. Also, some of today's leading parts manufacturers are represented by Pacific Aerospace. PAC activity in the aircraft overhaul field over a period of many years has resulted in facilities to handle aircraft from the smallest private ship to the largest troop carrier. An example is the most extensive and modification program in B-57 fighters and C-47 military cargo carriers undertaken by the Air Force. PAC manufacturer production equipment is found in an integral part of B-57 of all military fighters and commercial transport units.



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## PRODUCTION ENGINEERING

### Optical Tooling Faces Its Biggest Test

Accuracy of reassembly after teardown is under study for Air Force.

By Irving Stone

Progress with the optical tooling, a test indicator that has found widespread acceptance in U. S. aerospace production. Republic Aviation Corp.—sponsor in refinement of the optical system in combination with standard German pipe-frame coatings to simplify airplane teardown—now nearing completion of phase II of its Air Force contract for evaluation of this tooling technique (Aerospace Week, Dec. 17, 1959).

Under phase II, actually a service test trial, Republic tooling technicians are setting up large fixtures for production assembly of other leading airplane builders.

► **Cost-County Trial**—Last week some of these tools were being torn down, for air shipment to the various factory sites and reassembly there using the optical procedure. This operation not only will serve to establish the general feasibility, accuracy and advantages of the optical tooling system, but will also show its potential in achieving a quick, misassembly-free, after plant emergency breakdown.

Thus, if an airplane factory using fixtures set up with optical and frame coatings were bombed out or shut down for some other reason, these tools (for others taken from an emergency stockpile) could be quickly disconnected and flown to another site suitable for manufacture and reassembly. These tools, which could be stored with little delay. Every new fixture could be set up from scratch, at the site site as at a distant location, in a considerably shorter time than would be necessary for the erection of the conventional welded frame unit.

► **Test Fixtures**—Here are the four structures for which Republic has set up tooling or is now building fixtures to test the teardown-and-shipment-reassembly procedure under phase II.

► **North American F-95** (now designated F-68D) entry wing panel. Fixtures for this structure is already built, the assembled and painted in line sections on building for shipment. These portions are two end frames each measuring 12 x 66 x 100 in., base member (20 x



NORTH AMERICAN F-95 wing fixture with member carrying hook for testing edge-to-edge attachment separated for treatment. Other fixture parts: 1, rear span; 2, alternate large struts; 3, flap track; 4, landing gear; 5, fuel plate.



F-95 FIXTURE, ON SKIDS ready for air shipment, via Fairchild Freight, to West Coast. Components as labeled are: 1, base member; 2, top member; 3, fuel plate frame; 4, internal rail frame; 5, auxiliary rail frame.

10 x 100 in.), top member (26 x 10 x 200 in.); and a fuel plate frame (14 x 64 x 55 in.). Estimated weight of the frame is 3,655 lb.

► **Lockheed F-94** fuselage member side panel. Fixtures for this unit also is completed and is ready for disassembly and shipping when observed by the writer at Republic. It is a rectangular structure comprising a panel section measuring 47 x 52 x 285 in.; base portion (34 x 39 x 259 in.); and four diagonal braces (each 14 in. long, two 54 in. long, two 66 in. long). Weight is approximately 5,535 lb.

(Both the F-94 and F-95 fixtures

were sent for shipment to the West Coast on June 17. The F-95 fixture is tagged for receipt at North American on June 18-19, the F-94 next at Lockheed on June 21-22. This schedule gives a good idea of the speed with which this type of fixture can be transferred cross-country and set up for use at a site.)

► **Douglas C-124** tail section assembly.

► **Boeing B-47E** wing panel.

The fixtures for both the Douglas and Boeing structures are now in the process of building and should be completed at the very near future.

To build the fixtures, Republic re-

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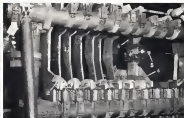
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LOCKRIZED PFM fixture before string alignment. Details 1, base for support; 2, dual turn angle; 3, large bracket for another turn angle system (designed to allow clearance for removal of part assembled in fixture); 4, drill hole for easy lift; and 5, base unit attachment.



PFM FIXTURE shows: 1, carriage corner plate; 2, weight to rotate Carriage casting rotated to be powered; 3, attack angle with pin for working in Carriage cap; 4, weight on optical positioner for locking corner plate; 5, reference on positioner; and 6, positioner's straightedge.

correct from these line drawings fabrication the specification and tool design drawings of the work as they were made, and designed them as they can be built to suit the Rapakko-developed optical positioner for alignment and the standard carriage for rotation. All these features, built under supervision of project engineer Richard Steyer, are given a "dry run" breakdown and recheck to check accuracy of the tool before alignment is the feature holder.

- Advantages Rapakko—Among the advantages of the optical tooling system for erecting assembly fixtures are:
  - Reduction in cost of tools, that lower the cost of the work.
  - Better surface accuracy, as important consideration in the fabrication of high-speed planes.
  - Key breakdown of fixtures into small components for quick, shipment by air.

- Rapid turning of consecutively square and round fixtures permitted.
  - With the conventional welded frame system, in many instances it was necessary to work to tolerances which were closer than the equipment (frame-load and piece work) could afford, and the only recourse was to control dimensions by physically marking fixtures from a center. This involved many duplicate tags, particularly as an expansion program.
  - If the master were destroyed for any reason, an identical unit could not be reproduced.
  - If the master were very large, it could not be made sufficiently rigid to ensure that its shape could be maintained.
  - If alignment of the master to a sub-assembly were necessary there would be no accurate means of determining, upon its receipt, whether it was still



STANDARD CASTINGS under fixture breakdown. Note joint in between base casting (left) and TIG0009 and 18 inch (right) which remain attached.

within the close tolerance requirements as had reference drawings in hand.

Coordinating Line—With the use of optical, Rapakko technicians find that there is a means of measurement to be used a degree of accuracy as may be required in the formable fixture.

With the system, dependence is placed on an optical line of sight for coordinates. This line of sight is considered a perfect standard because it travels in a known path (straight line, for practical purposes), it is unaffected by temperature, cannot wear, distort or sag, and does not exert pressure on the object being aligned.

By using optics as a control medium, it is only necessary to make readings when it is felt that it is more economical to build fixtures utilizing them.

Savings—Even though the advantages of the optical tooling system have been definitely established, it is still one subject to be in the development stage.

And as more experience is gained with the technique, greater savings in setup time undoubtedly will be realized.

Already Rapakko technicians have proven that with the optical tooling system the setup time for a complete fixture with fittings can be about 50 percent less, on the average, that that required for a conventional welded fixture. In some instances, savings as high as 50.60 percent have been found.

Savings on the erection time for the three fixtures with the standard castings amount to 60 percent on the average, as against time required for the welded frame.

Optics, Cooling Unit Refuse—The basic British (The Hiltner) optical system and the Rapakko-developed accessories (optical positioner, spherical mounts for telescope and target reflectors).

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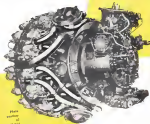


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economically—turn them out at war speeds. That's the

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adjustable brackets, etc.) were described in AVIATION WEEK's Dec. 12, 1939, discussion of the evaluation of the optical tooling technique, together with a brief mention of the German castings for frame assembly.

Actually, the basic optical measurements and the castings had been used in aircraft before dimensions had been set together.

The British used the elementary optical for the Aero Lancaster and obtained fairly accurate results, but the job was a tedious one and required highly skilled technicians.

The castings were introduced first in Germany at the Heinkel aircraft works in 1933, later made standard equipment by the German Air Ministry and were used extensively during the war in that country's aircraft industry. Japan acquired rights to their use in 1942.

Republic engineers saw the advantages of combining the optical and castings into a single system arrangement.

► **Phase III Completed.**—The castings, too, were a part of Republic's AF optical tooling division. Phase III calls for the design of American standard counterparts of the German units. Though phase II has not yet been completed, Republic pushed up its schedule on phase III and already has finished it.

Chief differences between the American and German standards are the use of the English instead of the metric system, inclusion of provision for use of 16-in. pipe in the American standard; the method of attaching wing boxes; and other changes generally improving the German design.

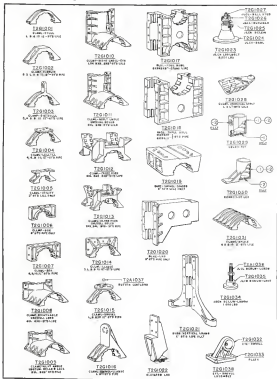
These American standards shown in the accompanying illustrations, are only tentative proposals and probably will be revised and implemented as more experience with the system is gained.

The castings are manufactured for Republic by Calumet Brass of Freeport, Long Island, N. Y.

► **Castings Rehearsal.**—Here are some of the new and conventional practices with the various casting units (the part names here are Republic's, in the following tabulation, only the last two digits are used except in serial listings).

- **T2G1000** This is a simple clamp used with other components for indicating frame fit.
- **T2G** The clamp has its surface which serves as stud location for.
- **T2G** Clamp-eye is used for attachment of rivet legs.
- **T2G** Large retaining surface is offsetted back and side run in and with part 50 for easy base of attachment.
- **T2G** Used instead of 51 for 7-in. pipe only.
- **T2G** and **T2G** Serve where top and top and side mounting holes, respectively, are desired.
- **T2G** and **T2G** Right angle hooking units incorporating right hand and straight legs, and straight beam and straight leg, respectively.
- **T2G** and **T2G** These castings have equal

## Standard Castings for Fixture Construction







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In the vast new expansion of our air might, SWEDLOW specialization in acrylic enclosures for aircraft is playing an increasingly important part.

30 years of pioneering in the precision engineering and production of windshields, canopies, and windows—with perfection in optical properties, regardless of size—has been an important factor in bringing to SWEDLOW the contracts of the great names in the aircraft industry.

Two plants in California and the centrally located plant in Ohio are now at the service of the aircraft industry, with duplicated facilities and tooling as a precautionary measure for any emergency.



• We shall be glad to assign a staff engineer to work with you in solving problems in plastic enclosures with new developments in the industry.

**INTRODUCTION**—Swedlow Plastics Co. is an equal opportunity employer. We are seeking men and women of ability and initiative for positions in engineering, design, production, and sales. We are located in the U.S. and Canada.

101 ANGELES, CALIFORNIA • YOUNGSTOWN, OHIO

1946 to get their reaction on the use of optics for future alignment.

Reports on that interest generally varied from negative to indifferent. The fundamental statement which applied to the industry at large on the basis of methods used by the British, which involved their application particularly sensitive to tilt (angular error) and an overall very accurate alignment and co-ordinate rapid future structure.

► **Republic, Instrumental**—However, Republic tooling engineers showed an immediate interest and the company were ahead with its own preliminary planning to determine what could be done to adapt the basic instruments for efficient future alignment. Republic showed an initial small exploratory AF contract in February, 1947. This investigation showed the shortcomings of the system previously used and also revealed what improvements were possible.

Then follows of an industry wide meeting at Republic in March, 1948, for a general discussion of the application of optics, and the future tooling—very rapidly. Being a tooling—engineer then interest.

► **Acoustics Developed**—From that point Republic's tooling expert, Adolph Kestelmeier, and his associates, started research on and development of the acoustics needed to make, precisely the use of optics for future alignment. Out of that work came the optical research for alignment of the British Turbo-Helium telescope and target article; optical power for mounting in a collimator, optical square, future fitting adapter plate and fitting in local points in relation to the simulated line of sight, adjustable leadlines, and other devices. These developments were demonstrated at an AF sponsored industry meeting at Boeing's Wichita plant in June, 1949.

► **Lower Costings**—Meanwhile, Fred was pursuing further the simplification of future construction. Working with him at AMC was August Bergmold, German-trained production engineer, who was in Republic's plant at manufacturing research and development.

Fred had heard of the standard Car von castings and Bergmold was familiar with their use in German's machine production. Bergmold made sketches of the walls, made a scale model of a future wing thus to facilitate study. After this, he and Fred went to Germany in 1947 to collect available data and drawings. Forty tons of the structural steel were shipped to the country from Meerscheidt's last plant in Krefeld and the main assembly site in Augsburg.

► **Second Contract Awarded**—Republic's technicians on the re-design of castings, using the rights with the structural castings in future work. As a result of the company's optical tooling develop-

# Jet Compressor Parts



Robbins Compressor blades for turbojet aircraft engines. Robbins Engineering specializes in the production of rotor components and complete rotor assemblies.



Above: Complete rotor assembly for turbojet engine, manufactured by the Robbins Engineering Company.

## Machined and Assembled to Rigid Specifications

The machining of jet compressor parts and the assembly of complete rotor units require an organization having specialized tooling and inspection equipment and plenty of aircraft know-how. Turbojet engine builders are enthusiastic about the work of the Robbins Engineering Company, a subsidiary of Ex-Cell-O Corporation.

The Robbins organization is cooperating wholeheartedly with the program to build up air power for the defense of our country. All its efforts will be directed toward this and in the present emergency.



ROBBINS ENGINEERING COMPANY  
Subsidiary of

EX-CELL-O CORPORATION

DETROIT 33, MICHIGAN



## Temperature SENSING ELEMENTS

**ENGINEERED AND  
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REQUIREMENTS**

Barber-Colman engineers will meet you at the design of any type of Sensing Element for individual applications. For further information see Barber-Colman Aircraft Products, write for Bulletin T-414.



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ment, it was able to propose a proposal to AMEC showing what amount of investment was necessary to adjust the system and outputs to aircraft industry requirements. It was given an AF contract in November, 1949, further to evaluate the testing technique. Included in the contract were the test fixtures to be built for Lockheed, North American, Boeing and Douglas.

► **Other Companies' Work—** Fairchild Engine & Airplane Corp. has recently received one of the Republic optical transmitters and reports are that it is using it for comparison with a conventional setting machine-another optical system for locating points in space.

Boeing received one of the fixtures some time back and is reported to be using it at a subcontractor's plant building tooling for the company. Boeing's Wichita plant is said to be using the optical system for the B-47, but not with all the refinements developed to date. Boeing is also working with it in Seattle.

Lockheed is training personnel in the use of the optical system, reportedly preparatory to applying it on some new production contracts.

North American is also studying applications of the system to its production.

Republic still hasn't reached the end of its development efforts to extend the versatility of the system. Even now its technicians are working on further refinements for greater efficiency in future alignment.

## Garnet Abrasive Saves Blasting Costs

Steel is synonymous with savings at Ryan Aeronautical Co., a reason is obvious: used in sandblasting stainless steel exhaust ports, garnet in suspension operations is consuming valuable processing time.

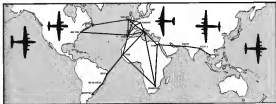
Ryan had been using a white silica sand for its high-pressure blasting. This material deteriorated rapidly into ineffective "round" crystals, creating a fine dust.

A reddish garnet sand was substituted and found to have 50 percent better "blasting" power. With the new material less air pressure is required and the dust problem is minimized. Microscopic examinations showed that when garnet sand crystals lodge down they still retained their sharp points.

There are other advantages. Because the garnet made lasts so much longer, the sandblasting machines do not have to be filled as frequently, less material means that trucking costs are cut, the new material is more resistant to moisture, better less has tendency to clog the blasting machine; and it does a faster job.

# KEY POINT PROGRAM

- provides aviation special products
- in conveniently small containers
- at key airports around the world



Relatively small amounts of certain aviation special products provided required for servicing today's transport aircraft assure the responsibility, so much as possible and engine oil, for thousands of trouble-free air miles down around the world every day. Although essential to the proper maintenance of modern aircraft, not all of these products are constantly required away from the home base, particularly in the remote locations where they are used.

For this reason, marketers of Esso Aviation Products determined which special products were needed for most often on the well-traveled air routes of the world and established a basic group of Esso Aviation Special Products used for aircraft lubrication and hydraulic fluids.

In addition to the hundreds of other airports where Esso Aviation Products and services are offered, these aviation special products are now available at all times in convenient, small containers at 17 key airports along the world's airways.

The smaller containers eliminate waste and the possibility of contamination. Air line operators find these specially convenient for "topping off" on the air route in route. In every respect, the key point program means added security in plane, flight engineers and international aircraft operators.

Esso Aviation Special Products are made to exact specifications and cover the wide range and necessary lubrication requirements of all commercial transports in general use today. Their quality and dependability have been proved in millions of miles of flight.

**WHERE you want them • WHEN you need them . . .  
ALONG THE AIRWAYS OF THE WORLD**

### The complete line of Esso Aviation Products:

- |                |                       |
|----------------|-----------------------|
| Gasolines      | Turbo Fuels           |
| Engine Oils    | Turbo Oils            |
| Gear Oils      | Corrosion Preventives |
| De-icing Fluid | Anti-ice Compounds    |
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ESSO EXPORT CORPORATION, AVIATION DEPARTMENT, 25 BROAD STREET, NEW YORK 4, N. Y.

# TEMCO versatility

expressed in the



T-35

## Buckaroo

MILITARY TRAINER

As rugged and ready as the colorful Texas cowpokes whose name it bears, the TEMCO BUCKAROO—now in limited service with the USAF—is an advanced design, all-purpose military trainer specifically engineered to meet the requirements both operationally and constructively of modern peacetime day air forces.

Another outstanding example of TEMCO versatility, the BUCKAROO is an all metal two place tandem, low wing monoplane powered by a 165 HP Franklin Engine, assembled both for primary and basic training.

Throughout the design and development of the BUCKAROO, TEMCO engineers have concentrated not only on providing an airplane that will best meet ordinary training requirements, but on providing one that will meet these requirements at the lowest possible cost both from the standpoint of original price and that of maintenance and upkeep. In the finished product, TEMCO is convinced that it has an airplane that will not only train military pilots better, but retain them at less cost than any other trainer presently available.



Designed for first flight as well as progressive military training, the BUCKAROO's rugged, its construction and design make it a truly all-around military trainer.

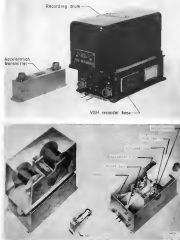


Repetitive engine direction of the BUCKAROO is an integral part of the forward canopy frame, providing full visibility from both main pilot as well as full protection for both pilot.



Texas Engineering and Manufacturing Co., Inc.

DALLAS, TEXAS



## New Instrument to Study Gusts

NACA velocity-gravity-height recorder has advantages over airline type, but is designed only for research.

A new, compact flight recorder and is now being used for the collection of airline operating statistics bearing on gust-related problems.

And this unit, already two-hundred pounds of weight, acceleration and altitude for continuous periods stretching to as much as 100 hr.

Developed at the National Advisory Committee for Aeronautics' Langley Lab, the new equipment is known as the VGH (velocity-gravity-height) recorder and was designed to meet these requirements:

• Continuous records of airspeed, normal acceleration and altitude against time with an accuracy within 1 percent of full scale.

• Maximum recording time of 75 hr. per loading, with sufficient resistance to permit counting and measurement of individual acceleration peaks.

• Location of a remote control section from transmitter for recording right over the airplane G.C., regardless of tractor location.

• Volume no greater than 1 cu ft., weight not more than 25 lb., case as stillness and loading.

• Minimum operational period of 100 hr. without rework.

• Automatic operation from standard aircraft power supply when plane is in flight.

Details of the device have just been released as Technical Note 2285.

## SIZE OR WEIGHT



## NO PROBLEM FOR

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A single Flying Tiger Learner takes away load up to 20,000 pounds... and Flying Tiger has 25 special air freight lines, an exclusive daily schedule, that carry anything from automobiles to engines from main cities to helicopters.

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throughout the world.

...WORLD'S LARGEST OPERATOR OF  
AIR FREIGHT AIRCRAFT

# WESTON TEST EQUIPMENT

...for electronic maintenance!



## Manual Conductance ELECTRONIC TUBE ANALYZER

Model 606 is an "all purpose" tube analyzer that tests tubes under exact operating potentials. Accurately determines true mutual conductance of all tubes both in new-tube and in manufacturer's rated operating conditions, as well as at other values for non-standard applications.



## High Frequency ELECTRONIC ANALYZER (Model 797)

Three instruments in one: a Volt-Gain-Millimeter with self-contained power source—a high impedance electronic Volt-Ohmmeter using 115 volt 60 cycle power—a stable, probe type Vacuum Tube Volt-meter for use to 200 megacycles.



## Portable Mutual Conductance TUBE CHECKER (Model 798)

For general testing of all receiving tubes, voltage regulator tubes and thyristor tubes. Provides mutual conductance ranges 1000/6000/12000 micromhos.

Order through your local WESTON representative, or write for literature... Weston Electrical Instrument Corporation, 579 Fredon Avenue, Newark 5, New Jersey... manufacturers of Weston and TAG-Inline instruments.

**WESTON**  
*Instruments*

"NACA VIG Recorder," by Norman K. Richardson of the Langley Lab.

It reports that from records now being obtained, three typical analyses can be made:

For gust research and related airplane loading—

- Evaluation of normal acceleration (vertical and effective gust velocities).
- Distribution of these elements and velocities with respect, altitude or flight conditions.
- Percentage of total flight miles spent in rough air.

For operation studies—

- Distributions of speed and altitude.
- Takeoff, approach and landing speeds.
- Percentage of flight time in climb and descent.

The V-G recorder previously developed at NACA (Amesbury, Mass., Nov. 13, 1957) gives an envelope of the maximum acceleration and the airspeeds at which they would occur. Development of the new VIG recorder was dictated by the need for a conveniently recording instrument affording a detailed distribution representing the frequency and intensity of gust acceleration with associated operating conditions.

Basic Considerations—NACA's principal requirement was reliable recording of the desired functions with an accuracy and form to make the data useful for research.

The aircraft was interested in size, weight, installation factor and recording nature.

Although the requirements generally parallel those set down by the Air Transport Area, and Civil Aeronautics Board for flight recorder, the ATA-CAB type is intended to compile data on airline operations and aid in determination of accident causes. The NACA unit was designed specifically as a research tool, hence was not accompanied to meet the ATA-CAB requirements in detail.

Trace type of amplitude recording was selected. Tests showed that the resistance of photographic film or paper was superior to that of the drum-recording type, which, in general, also requires extra stylus pressure giving attendant friction stress.

It was determined that maximum record speed should be about 1 ft./hr. (0.07 in./sec). Under lab conditions, it is possible at this speed to distinguish peaks of the same amplitude at the rate of two per second and peaks of different amplitudes at five per second. The recording paper—three wide by 120 ft. long—gives a recording time of about 160 hr. and easy visual inspection.

Makeup—There main parts of the instrument are the base which houses the recording elements, a recording drive and accessories transmittal. The non-bored base and recording drum assembly.

# Important Information

If you are a producer of products using steel, aluminum or copper, it is vitally important that you know what Controlled Materials Plan forms apply to your industry and how you may obtain them. We think the information on the three basic CMP forms listed below will be helpful.

**FORM CMP-4A:** For any producer of Class A products who is requested to apply for an authorized production schedule and related allotment by a Clearance Agency or consumer for whom he produces Class A products.

**FORM CMP-4B:** For any producer of Class B products who is requested by NPA to file an application with the appropriate industry Division for an authorized production schedule and related allotment.

**FORM CMP-4C:** For any person requiring an allotment for controlled materials for use in construction.

Further information on Class A and Class B products, as well as applications for CMP authorizations and allotments on these three forms, are available at your local National Production Authority field office or their headquarters in Washington.

## We also direct your attention:

**TO CMP REGULATION NO. 4** which sets forth the rules under which distributors such as ourselves may make deliveries of controlled materials to their customers.

**IT IS IMPORTANT** for you to know that whenever you place an authorized controlled material order with a distributor either orally or by telephone, it must be followed by a written confirmation within 15 days. If a customer fails to comply with this provision, a distributor is

required to report the delinquency to the National Production Authority.

**WE THEREFORE URGENTLY REQUEST** that directly after placing an authorized controlled material order either orally or by telephone with your distributor, you immediately send him a written confirmation. By doing this you will protect yourself and help your distributor and the National Production Authority keep CMP working smoothly.

# UNITED STATES STEEL SUPPLY COMPANY



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UNITED STATES STEEL

**ONLY FIELD, Paris, France.** The first GCA radar landing system has just been installed by Gilfillan at the largest civil airport in France. The entire design, production and installation were accomplished by Gilfillan personnel...  
 Gilfillan was the *only* civil airport GCA equipment installed in Europe or the United States.



*"C'est Magnifique!"*  
*-on dit a l'aéroport d'Orly, Paris*



*"It's Magnificent!"*  
*-they say in the U.S.A.*



**3000" TOLERANCE OVER A 14 FOOT SPAN!**  
 Making the 14 foot structure into a precision structure was one of the toughest jobs Gilfillan solved. To do it, Gilfillan developed a special plastic resin. The resin was set in this way, sealed in an actual position while the plastic hardened. Then it was machined to 3000" tolerance with no chance of expanding out of shape once it left the mold.



There is inspection system for quality control. One reason for Gilfillan's acknowledged success in solving "precision-plus" electronic equipment is the unusual discipline system used. A half of an hourly skilled inspection report directly to the head of the company.



**13 MEN OF SCIENTIST EMPLOYERS** Each producing GCA has 13 men of science. Making it simple to assemble and repair to maintain was a challenge of major dimensions. Standard color coding of wiring made it work. Therefore, Gilfillan devised a system of standardizing each man by engineering reliable numbers at several intervals!

**GCA Gilfillan**  
 LOS ANGELES  
 FIRST AND FINAL WORD IN GCA RADAR



**TOWER CONSOLE.** Gilfillan's new receiving equipment "pipe" GCA into the tower from the field antenna unit. Now GCA is operated by one man at the digital tower instead of four men at a console, one man at the console, instead of the former busy two-man, multi-console equipment.

## AT YOUR FINGER TIPS

COLOR CODES for  
Pyrometer Wires

TOOLS AND COLOR CODES  
AND EXTENSION WIRE

| CALIBRATION FOR THERMOCOUPLES |          |
|-------------------------------|----------|
| TEMPERATURE (°F)              | EMF (mV) |
| 0                             | 0.000    |
| 100                           | 1.432    |
| 200                           | 2.864    |
| 300                           | 4.296    |
| 400                           | 5.728    |
| 500                           | 7.160    |
| 600                           | 8.592    |
| 700                           | 10.024   |
| 800                           | 11.456   |
| 900                           | 12.888   |
| 1000                          | 14.320   |
| 1100                          | 15.752   |
| 1200                          | 17.184   |
| 1300                          | 18.616   |
| 1400                          | 20.048   |
| 1500                          | 21.480   |
| 1600                          | 22.912   |
| 1700                          | 24.344   |
| 1800                          | 25.776   |
| 1900                          | 27.208   |
| 2000                          | 28.640   |
| 2100                          | 30.072   |
| 2200                          | 31.504   |
| 2300                          | 32.936   |
| 2400                          | 34.368   |
| 2500                          | 35.800   |
| 2600                          | 37.232   |
| 2700                          | 38.664   |
| 2800                          | 40.096   |
| 2900                          | 41.528   |
| 3000                          | 42.960   |
| 3100                          | 44.392   |
| 3200                          | 45.824   |
| 3300                          | 47.256   |
| 3400                          | 48.688   |
| 3500                          | 50.120   |
| 3600                          | 51.552   |
| 3700                          | 52.984   |
| 3800                          | 54.416   |
| 3900                          | 55.848   |
| 4000                          | 57.280   |
| 4100                          | 58.712   |
| 4200                          | 60.144   |
| 4300                          | 61.576   |
| 4400                          | 63.008   |
| 4500                          | 64.440   |
| 4600                          | 65.872   |
| 4700                          | 67.304   |
| 4800                          | 68.736   |
| 4900                          | 70.168   |
| 5000                          | 71.600   |
| 5100                          | 73.032   |
| 5200                          | 74.464   |
| 5300                          | 75.896   |
| 5400                          | 77.328   |
| 5500                          | 78.760   |
| 5600                          | 80.192   |
| 5700                          | 81.624   |
| 5800                          | 83.056   |
| 5900                          | 84.488   |
| 6000                          | 85.920   |
| 6100                          | 87.352   |
| 6200                          | 88.784   |
| 6300                          | 90.216   |
| 6400                          | 91.648   |
| 6500                          | 93.080   |
| 6600                          | 94.512   |
| 6700                          | 95.944   |
| 6800                          | 97.376   |
| 6900                          | 98.808   |
| 7000                          | 100.240  |
| 7100                          | 101.672  |
| 7200                          | 103.104  |
| 7300                          | 104.536  |
| 7400                          | 105.968  |
| 7500                          | 107.400  |
| 7600                          | 108.832  |
| 7700                          | 110.264  |
| 7800                          | 111.696  |
| 7900                          | 113.128  |
| 8000                          | 114.560  |
| 8100                          | 115.992  |
| 8200                          | 117.424  |
| 8300                          | 118.856  |
| 8400                          | 120.288  |
| 8500                          | 121.720  |
| 8600                          | 123.152  |
| 8700                          | 124.584  |
| 8800                          | 126.016  |
| 8900                          | 127.448  |
| 9000                          | 128.880  |
| 9100                          | 130.312  |
| 9200                          | 131.744  |
| 9300                          | 133.176  |
| 9400                          | 134.608  |
| 9500                          | 136.040  |
| 9600                          | 137.472  |
| 9700                          | 138.904  |
| 9800                          | 140.336  |
| 9900                          | 141.768  |
| 10000                         | 143.200  |

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Write Today for your copy. No obligation, of course.

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PAID LAWN, NEW JERSEY

## 50,000 PSI BOOST PUMP

Air Operated Hydraulic Boost Pump  
capable of output fluid pressures to  
50,000 PSI from 100 PSI plant air  
supply.

Broadly applicable for static testing,  
powering presses for metal forming,  
shearing, clamping, etc. Various models  
available for either oil or water service  
applications where low volume output  
at high pressure is the requirement.  
Thousands in use. Simple... Reliable  
... Inexpensive.



### AIR OPERATED HYDRAULIC POWER UNIT

A self-contained unit supplied complete with Model  
200-C Pump, air reservoir and necessary controls.  
Capable of providing output fluid pressures to 50,000  
PSI from 100 PSI plant air supply. For air service  
only. Other models available for water or other cor-  
rosive liquids.



**SPRAGUE ENGINEERING & SALES**

1346 W. 123rd St.

Greenwich, Conn.

area 34 in high x 34 in high x 12 in. long, and weighs 17 lb. This installation is normally shock-mounted and mounted usually in the midline rack. The remote accelerometer is 14 in. wide x 24 in. high (including connections) x 74 in. long, weighs 29 lb. It is rigidly mounted near the plane's C.G.

Each element uses a tilting mirror and lens to focus the image on the moving record paper. A 30-lin./in. slit passes the light to give fine lines.

To monitor inspired and expired, two cells containing pressure-sensitive diaphragms are connected to the phos-  
phor film. These diaphragms deflect in proportion to the inspired pressure and the motions are magnified and transmitted by the tilting mirror. Each cell houses a feed mirror to provide record substance lines.

Recover for the signal from the accelerometer transducer is a *deAussel* type of reflecting galvanometer.

An electric clock sweeps a mirror to give a line across part of the paper while for a *deAussel* being referred.

► **Transmitter, Range Data**—The accelerometer transmitter uses wire stress gauges mounted on a customer base and wired in the form of a Wheatstone bridge whose output voltage is proportional to the measured acceleration. The base is housed in a sealed case filled with silicone oil serving as a damping medium and protecting the paper from moisture.

A natural frequency of about 22 cps is considered low enough to isolate it from engine vibration but sufficiently high to respond faithfully the gas accelerometer normally encountered. To maintain the transmitter at a constant temperature, it is fitted with a 25w heater and thermostat.

Full scale deflections for each function is about 11 in. Typical ranges are:

- 0 to 150 mph
- —2G to 2G
- Sea level to 35,000 ft.

Adjustments allow other ranges.

► **Applications Limitations**—Accuracy of recording of the various elements is adequate for the statistical study of gust problems. But in actual practice, accuracy of data obtained with the instrument is also dependent on installation and reading from installation error caused by assumed to specific terms because it depends on a given aircraft structure and its vibration system.

Assuming a reading accuracy within  $\pm$  41 in and correction of position error by calibration, a released air speed of 250 mph would have a possible error of  $\pm$  24 mph. A speed of 100 mph would be accurate within 5 mph.

Similarly, determination of pressure altitude would be accurate within



General Electric  
Turbojet Engine

- From pistons to turbines—we continue to advance with the aviation industry. Our production includes substantial commitments for Gear Box Assemblies, Auxiliary Drives, Hydraulic Gear Box Drive Assemblies, and Gear Assemblies for J-47 Jet Engines.

With facilities that produced thousands of reciprocating engines in World War II, we are now manufacturing our own engines, airframe and landing gear components for the military service.



**JACOBS**

AIRCRAFT ENGINE COMPANY  
POTTSTOWN, PENNSYLVANIA

# How to Solve POWER TAKE-OFF PROBLEMS

$$1P \div 4A = ?$$

**PROBLEM:** Your problem may resolve itself to a requirement for four accessory drives but only one available pad. Modern aircraft engines are equipped with many power take-offs, but there are always demands for more to drive fuel pumps, hydraulic pumps, generators, alternators, de-icers, superchargers, air compressors, starters, etc.

**SOLUTION:** When the distribution of motive force to most accessory drive requirements becomes your problem, consult Western Gear's experienced and capable aircraft application engineers. For more than a decade aircraft designers have brought their mechanical power transmission problems to Western Gear for economical, dependable and efficient solutions.



## TYPICAL ACCESSORY DRIVES BY WESTERN GEAR Contributors to the Aircraft Industry

Western Gear drives are used on all types of aircraft engines, for applications to everything from standard commercial and military aircraft to rockets and guided missiles.

Units of many configurations, including integral accessory drives for a 10,000 hp propeller unit, are in the usual outfit of Western Gear experience.

For the **RIGHT** answer to any problem of gearing for an aircraft, direct your inquiry to Western Gear Works, 2000 West Imperial Highway, Lynwood, (Los Angeles County) Calif.



Plants • 401 South Ave. St. Louis 4, Mo.  
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2000 Wilson St., San Francisco 3, Calif.  
2017 21st Ave. St. Louis, Mo.

Representative • 120 S. E. Oak St., Portland 14, Oregon  
Branch • 1011 Commercial St., Seattle, Oregon  
Engineering & Machinery Ltd., 194 W. Bowdoin, Vancouver, B.C.

## WESTERN GEAR WORKS

Manufacturers of PACIFIC GEAR WORKS

## Pacific Gear & Tool Works

Factory, Seattle, Wash.  
Branch, Portland, Ore.  
Branch, Vancouver, B.C.  
Branch, Seattle, Wash.  
Branch, Portland, Ore.  
Branch, Vancouver, B.C.

in 190 ft. at 30,000 ft., and service ceiling is 190 ft. at 20,000 ft.

Measurement of acceleration at the plane's G-G does not necessarily represent the acceleration of an equivalent rigid airplane because of the structural dynamic response. If the acceleration of an equivalent rigid airplane is desired, an accuracy of the measured data can be given since the effects of dynamic response will depend on a given aircraft. The problem remains to be resolved experimentally.

The instrument will give a series of data with little operational effect. However, there is limited detail particularly in the acceleration record when the random noise permits the existence of effective gust values but does not permit evaluation of the gust situation.

While the record traces are dense, the compact time scale does not make the details of the gust structure visible. Two speed studies, first difficulty could be eliminated by boosting paper speed. This change would shorten the recording interval and reduce the application of the instrument for use in the future.

## Book Tabulates College Research

The engineering schools of American colleges and universities are spending an average of \$50 million annually to carry on over 1,100 engineering research projects, representing the efforts of more than 11,500 faculty, graduate students and research engineers.

These data highlight the 1951 edition of the "Review of Current Research" published by the Engineering College Research Council of the American Society for Engineering Education.

The book has been called the only complete guide to the current research contributions of engineering schools. It has completely revised tables, tables of acceptable administrative officers, the governing research policies, members of personnel engaged in research, research organizations and special conferences and their research of interest.

The Research Council believes that this volume should be a useful guide to the research activity and capacity of American engineering schools. The data are current and complete as of May 1, 1951.

An indication of the amount of research activity going on, the index lists 65 different projects under "Research" 14 under "personnel" and 79 under "organizations".

Copies of the book may be obtained from the Secretary of the Engineering College Research Council, Room 7104, 77 Massachusetts Ave., Cambridge 39, Mass. Price is \$2.75—DRA.

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## Gust Alleviators

U. S. system based on wing deflection; British use probe in nose.

Research on gust alleviators is paying off with concrete designs on both sides of the Atlantic.

Here in the U. S., the Air Force and Douglas Aircraft Co. cooperatively have developed a device—a simple mechanical linkage to silicon—to relieve gust-caused stresses. And flight tests on a C-47 at Douglas' Santa Monica plant are reported to have convinced engineers there of the feasibility of the installation. In England, British Aircraft Ltd. has developed an alleviator which is being flown in a Lancaster.

Aside from the benefits of safety afforded by the alleviator, according to CADD Technical Data Digest, relief of gust effects will make possible a lightening of structure, resulting in appreciable operational benefits.

Recently it reports that engineers concerned with the development feel that in a cargo plane with a gross of 100,000 lb., use of the alleviator would point a cut in weight of the basic structure of 2,000-3,000 lb.; or it could make possible an increase in level flight speed of as much as 25 percent—in appreciable gain in the cost of a 100-mpg plane.

Cutting the structural weight of the plane would give greater range for the same amount of fuel, or if the weight reduction is put back as fuel, more payload range is obtained, or the weight reduction can be carried as additional payload for the same distance.

**How It Operates**—The Air/Douglas gust alleviator, according to CADD, works this way:

When an upward gust hits the plane, the wing bends upward, the deflection being converted through a mechanical linkage to silicon meters, causing the silicon to strain up. Amount of deflection is determined by a fixed ratio to the amount of wing deflection. The silicon strains the silicon on the wing just a relieving effect. For a downward gust, the silicon is deflected down for a similar effect.

Alarm meters from the gust alleviator is superimposed on that required to roll the plane, the alleviator on each wing acting independently on its own silicon.

**English Scheme**—The English installation appears more complicated than the Air Force-Douglas-developed arrangement.

The gust detector shaft, according to the British publication *The Aeroplane*, (Continued on p. 53)

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tingling sense of courage and hard work—a dramatic tale of people and events that is sure to give you both entertainment and information.

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**CONTENTS:** The Dwindling Flying Foreman • The Western Pioneer • West Meets East in Chicago • The First Air Transport Giant • Who's Flying This Plane? • Air Transport's Fuel Piser • The Air Mail "Turps" • United Unchecked • The Modern Maple Carpet • Wall Wings • Chaos on the Airways • People Make an Airline • Flying Back, Wide, and Handsome

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WEEK (MAY '82, p. 28) showed that most members of the graduating class this year already had accepted job offers. That study further concluded that there would be no increase in the numbers of engineering graduates over the next five years, and perhaps even lower.

The release from the Commission further underscores that viewpoint. The industry can hope only to relieve the engineering shortages, not "eliminate" it.

## NACA Reports

\* *Comp. of Lead at Various Temperatures (TN 2512)*—by Peter W. Nounis and J. S. Kuchler (Carnegie Institute of Technology)

This investigation was started to obtain stress-strain curves, creep data and elastic constants for single crystals of lead over a wide range of temperatures. It was conducted at the Carnegie Institute of Technology with financial assistance from the NSC.

Although the subject may seem far removed from practical application in aviation, it must be remembered that the mechanisms of creep is not completely understood. It must be further considered that creep is one of the most severe problems in the selection of materials for high-temperature operation.

Consequently, in studying the creep process for lead under  $\text{He}^+$  conditions which are far easier to obtain than those representative of gas-metal systems, the following analogies can be drawn between the behavior of lead and other metals:

The report should be considered in this light—**DATA**.

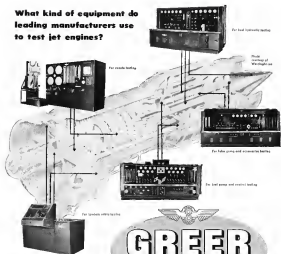
• **Fatigue Testing Machine for Applying a Sequence of Loads of Two Amplitudes (TN 3327)**—by Frank C. Smith, Dariusz M. Hrynko, Jr. Smith and Richard Howell (National Bureau of Standards).

Two nominally identical machines were constructed which are capable of subjecting sheet-metal specimens to a prescribed number of cycles of tensile fatigue load, automatically changing the load amplitude for another prescribed number of cycles, and repeating the loading schedule until failure of the specimen.

These researchers make possible the systematic study of the effects of a wide range of stress-cycle combinations on the fatigue strength of sheet materials. The researchers can apply painting as well as completely covered steel bolts.

The machines were constructed at NBS under sponsorship and with financial assistance from NAC-A-DAS.

**What kind of equipment do leading manufacturers use to test jet engines?**



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### TABLE OF CONTENTS

#### NONMETAL ALLOYS

Specifications  
Grades

#### PHYSICAL PROPERTIES

Specific Gravity  
Thermal Expansion  
Thermal Conductivity  
Electrical Properties  
Electrical Conductivity

#### MECHANICAL PROPERTIES

Tensile Properties  
Compressive Properties  
Shear  
Bending  
Modulus of Elasticity  
Modulus of Rigidity  
Poisson's Ratio

#### ORGANICAL PROPERTIES

PRODUCTS MANUFACTURED  
Primary Magnesium  
Alloy Ingots

#### CASTINGS

##### SAND CASTINGS

Grades  
Alloys  
Tolerances  
Feeders  
Pouring  
Heat Treatment  
Finish

##### PERMANENT MOLD CASTINGS

Alloys  
Grades  
Heat Treatment

#### CASTINGS—Cont'd

##### RECASTINGS

Alloys  
Design  
Size  
Size and Tolerances  
Finish

##### EXTRUSIONS

Grades  
Alloys  
Size  
Finish  
Tolerances  
Lengths

##### ROUND RODS, BARS, AND STANDARD STRUCTURAL SHAPES

Grades and Weights  
Tolerances

##### TURNING

Grades and Weights  
Tolerances

##### FORGING

##### SHEET, PLATE, AND STRIP

Grades  
Alloys  
Finish  
Size and Weight  
Tolerances

##### MELTING FLUXES AND AGENTS

WELDING RODS AND FLUXES  
SOLDERS

BACKCOVER LISTING

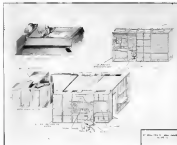
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NAVIGATORS, BOMBERS practice as they transportable training unit.

## New Radar Trainers for USAF

Production stage reached on avionic devices to school tail gunners and navigators and bombardiers.

Once simple electronic devices to train pilots have passed a whole battery of gun, radar, battle, and tactics tests to train each squadron of an air crew. Two of the best complex are now being put into production by Transducer Corp., Boston.

One is the AN/APG-71 gun-ranging radar trainer for tail gunners, the other is the AN/APG-72 navigational bombing trainer. Having worked for years to

develop prototypes of the two devices, Transducer now has orders totaling more than \$16 million for production versions.

• **Conditioning Trainers**—The heart of the gun-ranging trainer are on a massive 60-cu.-ft. cabinet with the instructor's panel in the center. From here he can place on the gunner's radar screen one or two blips representing attacking planes at various ranges and angles at

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The light sends these lines and each time it crosses a line it transmits a pulse to the remotely located transceiver's gas lighting scope. The big indicator disc indicates the position of an attacker plane.

Using the three large dash with forward indicators above them, the programmer changes the attacking "plane's" attitude. The cross pointer under the counter did shows how well the trainer is doing in getting the attitude in line right. The clock at top of the cabinet ticks off the time it takes the trainer to get locked on the target.

Other voltmeters, lights and buttons on the panel are used to introduce gun range and landing signals, recovery round

find, bits scored and other information. The instructor can use both light sources and strips of paper to put two targets on the screen simultaneously, or he can switch from one to the other and gauge the student's ability to switch targets.

A persistent sound of the trainee's position in all collections is made.

► **Navigator-Bomber Trainer**—Trainee's navigational/bombing trainer is based on the principle that the speed of sound in water is 1,500,000; the speed of electromagnetic waves in air. Thus a terrain contour map scaled 200,000 to 1 is interpreted in (artificial) sound to a constant temperature. This method has been used for some time by USN's School of Aviation Medicine in Randolph AFB to teach, on radio interpretation (Aviation Week Mar. 19, p. 29).

In the Transducer application, the map is submerged in a tank and above the map, but also submerged, is a simulated radar antenna which can be maneuvered by the customer to any position above the map. This antenna illuminates the mine in flight.

As the seismic units sound pulses at ultrasonic frequencies, the pulses strike the tag and are reflected back, picked up and converted to radio signals.

on the tractor's scope. The astronaut can look onto the system-mounted ground-based radar beacon and jamming masks.

Two plotting boards are used by the instructor to determine a student's ability. One is called a correspondence to the size of the map and shows the navigator's performance. The other records the flight of the aircraft in the target area and shows the bomb release point and the impact point.

This tower has a variety of potential uses in addition to routine pumping of householders and managers. One possible use is for broiling of air cures on the terrain over which they will be relieving an actual hazardous material.

• **Two Venose-Transducer** is now producing two versions of this transducer. The T1, a fixed installation with a tank 9 x 16 ft., in which can be simulated the terrain in an area of nearly 500,000 sq. m., and the T2, a portable transducer with a tank 6 x 9 ft., which can simulate a 75,000-sq. m. area.

The T1 trainer can be disassembled and moved by air to forward bases where it can be set up as early as 12 hours. It can be used for the same purposes as its larger counterpart with the exception that there is a training station for only one navigator or bombardier instead of the battery of training booths in the T1.

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## FINANCIAL Copters Lure Speculating Public

Despite financial history, the rotary-wing industry's favorable outlook is reflected in market interest.

Investment interest in helicopter stocks continues to increase and is being reflected in new financing.

The most recent sale of \$7,700,000 in 5 percent convertible income debentures by Hiller Helicopters is another indication of the broadening public participation in the helicopter industry.

The strong speculation has of the new aviation development greatly hastened the sale of the Hiller debentures. While the company has produced both engine types of its own and is now a major factor in the industry, it is completely lacking in a past record of profitability. To be able to market a new line of securities in the face of development costs and operating deficits is a significant accomplishment.

**Hiller History.**—Hiller Helicopters is the corporate name of the business as operated in United Helicopters, Inc. In December, 1949, the company was in the development stage prior to starting commercial production. All of its operating expenditures were capitalized as helicopter development costs during these initial three years. With the start of commercial production in 1954, certain additional tooling, engineering, research and patent costs were capitalized in both 1954 and 1955.

Nevertheless, Hiller experienced operating deficits in 1949, 1950 and thus far in 1951. For the year ended Dec. 31, 1950, the net loss amounted to \$12,821. For 1951, the net loss approximated \$187,415. In the two months ended Feb. 28, 1951, a net loss of \$14,433 was experienced. The management also expressed the opinion that as much as March and April will amount to the first two months. Of the company's total resources of \$5,356,814 at Feb. 28, 1951, \$1,127,507, or more than one-third, represents research and development costs to be amortized against future year operations.

**Debtless Conversion.**—The debentures are made attractive through a conversion feature. While a major portion in the capital structure is thus absorbed, no interest is provided to participants as any outstanding possibility that may accrue to the common stock. The conversion on the debentures is at the rate of \$10 per common share up to May 1, 1954, and at 100 cents thereafter.

These debentures will be used to retire

\$725,000 in secured debt and to provide additional working capital.

Hiller had 191,000 shares of capital stock outstanding Feb. 28, 1951. Of these shares, 150,000 were sold at \$10 per share. The remaining 41,000 shares were issued to Stanley Hiller, Jr., in exchange for his personal and assets acquired by the present corporation. These 100,000 shares are held in escrow in keeping with the order of the Federal Corporation Commission under certain conditions.

In addition, a total of 61,600 warrants were issued initially to the underwriters, Myths & Co. and Lehman Brothers, as additional compensation. These warrants are convertible at an initial rate of \$50 per share, changing in subsequent years to match the conversion rate of the debentures.

It is also contemplated by the management that 150,000 shares may be made available to certain officers and key employees at \$10 per share. This has, however, not been done as yet.

Accordingly, if all of these shares are issued and sold at the conversion rate, a total of 966,000 shares of common stock will be outstanding. Any earnings—or losses—that may develop will be against this projected registration.

As a result of the Hiller sale, the company's capitalization is now \$5,790,000, represented by debt and common stock. Total liability backlog was last reported at approximately \$15 million. It will be necessary for the company to convert this backlog, together with such new business as it may obtain, into completed deliveries before an approach to earnings may be made. The degree of profitability would not, however, have until its capitalization may be supported.

**Pasero's Story.**—Another major factor in the industry, Pasero Helicopters Corp., appears to have completed its earlier financing step. About a year ago, in order to obtain additional capital, the company sold a total of \$900,000 in five-year convertible notes.

Due to the company's rapid development and interest accorded the helicopter as a result of initial experiments as the Kaman was, a sharp market appreciation took place in the Pasero common stock. (Associated Press, Jan. 22, 1951). As indicated at that time, this provided a favorable background



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The unique Plate-Lok has assembled into a single channel; cam bolts or pre-stressed strands may be threaded through channels in a safe mode of not opening are available, channel lengths and spacings can be supplied to your order.

### FLOATING ANCHOR

New in design, form and adjustment—this is the only one-piece anchor, nut, plate, angle, or screw—can be used in any mode of use. The unique Plate-Lok has assembled into a single channel; cam bolts or pre-stressed strands may be threaded through channels in a safe mode of not opening are available, channel lengths and spacings can be supplied to your order.

**PROBING:** Tell us about your technical problems. We'll supply experimental quantities free. (K1816)

Write for your free copy NOW!



Boots Aircraft Nut Corp.  
STAMFORD, CONNECTICUT

# ARO

## PRECISION Aircraft Products

built with years of know-how!  
CHECK YOUR NEEDS!

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| <input type="checkbox"/> OXYGEN<br>REGULATOR<br>A-101-A           | <input type="checkbox"/> VACUUM<br>PUMPS<br>A-100-00              |
| <input type="checkbox"/> HIGH PRESSURE<br>CHECK<br>VALVES<br>N515 | <input type="checkbox"/> LOW PRESSURE<br>CHECK<br>VALVES<br>N510  |
| <input type="checkbox"/> SUCTION<br>REAR<br>VALVES<br>N100        | <input type="checkbox"/> FUEL/PAVE<br>SAFETY<br>VALVES<br>N100    |
| <input type="checkbox"/> OIL<br>SEPARATORS<br>A-101-A             | <input type="checkbox"/> OXYGEN<br>TESTING<br>EQUIPMENT<br>O1-100 |
| <input type="checkbox"/> ELECTRONIC ICE<br>DETECTORS              | <input type="checkbox"/> URGENT OXYGEN<br>CONVERTERS              |
| <input type="checkbox"/> HYDRAULIC<br>MOTORS                      |   |

Are Engineering "men at work" before World War II... designing and building precision instruments and devices widely used in aircraft.

Today—ARO's years of experience and modern facilities are important to users of aircraft products such as those. Whether it's oxygen regulators, vacuum pumps, check valves... at other units... ARO builds "men at work" for precision and performance! Send for complete information. The Aero Equipment Corporation, Peoria, Ohio.

**ARO AIRCRAFT PRODUCTS**  
MEN AT WORK... (Aero Equipment Corporation, Peoria, Ohio)

for forming conversion of the notes by calling them for payment a few months ago. In the process a total of 24,083 additional common shares were created and the \$300,000 debt eliminated.

Pacetti has shown profitable operation in each of the past three years. Its earnings started steadily from \$65,697 in 1943, to \$107,945 in 1949, and to \$158,497 in 1950. In broadening its financial pattern, the company also declared a two-for-one stock split shortly after calling the notes for redemption and financing their conversion. As a result, instead of the 140,719 shares outstanding at the 1950 year-end, the total common stock now outstanding is around 281,438 shares. Instead of the old, equivalent of around \$40 per share for the old stock at the height of the Korean helicopter boom, present market prices for the new stock are around \$14 per share. (This is equivalent to around \$28 for the old stock.)

It is significant that Pacetti does not show any defined development costs in its balance sheet to be amortized against future operations. Such equipment, research, and development charges appear to be absorbed on a current basis. The company's backlog was last indicated at more than \$100 million, up substantially from the \$10 million reported at the 1949 year-end. With expanding production facilities, deliveries may be expected to mount considerably. Here too, the ultimate extent of profitability will be determined when the completed assets are totaled.

► **Competitive Industry**—While Hiller and Pacetti are exclusively manufacturers of helicopters, they are by no means the only ones in the industry.

WEC established in the helicopter industry are a member of Helicopter Aircraft Builders, whose major purpose, actually at present, is to develop their helicopter products.

In this group are Bell, Sikorsky division of United Aircraft, and McDonnell. It is difficult to assign a percentage of the total volume of activity in each instance representing the helicopter operations. All three of these companies, however, have "substantial" service contracts for their helicopter designs and are aggressively pursuing engineering research and development in one or more advanced models.

There are other companies with engineering designs for helicopters, who are less helpful of presentation with a model that will prove acceptable to the military and fewer likely to be commercial entities, contracts with an ultimate reliance to a commercial market whose depth remains unknown.

It is these factors which will combine to make the market for helicopter activities an extremely hot one some time in the future.

—Selig Akshof

# It's Rugged... Roomy... Comfortable!

**Cessna**  
170



## IT'S AMERICA'S LOWEST PRICED 4-PLACE, ALL-METAL PLANE... by Several Thousand Dollars

1. **All-metal construction? A must!**  
Open it up side by side with any other new airplanes under \$12,000. You will get more miles per gallon at high cruising speed than anything else in its class. Check results of recent efficiency tests.
2. **Big enough to 4 adults travel in comfort?** Yes. Room for four adults to relax several hours in comfort, plenty of leg room in rear and front seats.
3. **Low noise level?** Yes. Try conversing during flight from front to rear seats in normal tone, across the back.

5. **Abundant payload? Yes.**  
Carry four people, and baggage and gas for a 500 mile jump (full tanks at gas). You can do this safely in the Cessna, without exceeding the C.A.A. certified payload of the airplane.
  6. **Over-all reliability? Yes.**  
Rugged construction, spring steel landing gear, proven power plant, built-in quality, backed up by years of experience building fine airplanes.
- Remember the Cessna 170 from prospectus to order—you will find outstanding quality throughout... very rugged construction... performance is entirely inside the job!

Today 1951, the Cessna 170 stands out after five years of use, regardless of price.

**Cessna**  
T-10 SERIES

CESSNA 170 SERIES  
ON DISPLAY AT  
YOUR CESSNA DEALER'S



A big beautiful plane that's perfect for three or four adults, and plenty of baggage and gas for a 500 mile jump (full tanks at gas). You can do this safely in the Cessna, without exceeding the C.A.A. certified payload of the airplane.

### MAIL THIS COUPON NOW!

Cessna Aircraft Co.  
Dept. A-101, Wichita, Kansas  
Please send me literature giving complete description of the Cessna 170.

Name \_\_\_\_\_ Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_  
Zip \_\_\_\_\_ Phone No. \_\_\_\_\_



# DURANICKEL

A wrought, age-hardenable,  
corrosion-resisting alloy

Duranickel® is a wrought, non-ferrous, slightly magnetic alloy. It has the higher strength found only in the heat-treated alloy steels, and not offered by other corrosion-resisting alloys available at comparable cost levels.

The principal engineering characteristics of Duranickel are:

- Mechanical Properties:** The accompanying table shows the ranges of Ultimate Tensile Strength, Yield Strength, Elongation, and Modulus values for various forms and conditions of Duranickel.
- Shear Strength:** Values for the ratio of maximum shearing strength to ultimate tensile strength range from approximately 0.8 to 0.9 and are comparable to those of mild and low-alloy steels.
- Resistance Limit:** In rotating beam tests of polished specimens at room temperature and 10,000 rpm for 10<sup>7</sup> cycles, Duranickel hot-rolled showed an endurance limit of 51,000 psi; hot-rolled, age-hardened showed 52,000 psi; cold-drawn 51,000 psi; and cold-drawn, age-hardened showed 61,000 psi.
- Impact Strength:** Charpy impact strength ranges from 200 ft. lb. for hot-rolled Duranickel and 290 ft. lb. for cold-drawn, to 40 ft. lb. for the age-hardened condition.
- Spring Properties:** Duranickel wire can be cold-drawn and age-hardened subsequently to develop tensile strength of the order of 250,000 psi. The theoretical proportional limit of cold-drawn and age-hardened wire is about 40 per cent of the ultimate tensile strength. Duranickel springs are used at temperatures up to 650°F., the stresses and should be governed by service conditions.
- Working Characteristics:** Duranickel may be hot-worked, forged, and cold worked. It can be hot-rolled most readily in the annealed condition and is commercially available in other conditions

of hardness up to 275 BHN. The use of a cutting lubricant is essential for all machining work between Duranickel, like all high-nickel alloys, is characteristically "sticky" and tends to gall or build up on the tools. Duranickel can be joined by the usual welding, brazing and soft soldering processes common to engineering.

- Valuable:** For special uses there are two alloys similar to Duranickel. They are: (1) Duranickel "B" containing a higher percentage of carbon for use where applications require optimum machinability. (2) Permalloy® having the same mechanical properties as Duranickel but different physical constants, particularly better electrical and thermal conductivity and stronger magnetic properties. Permalloy is preferred for service as springs requiring high electrical conductivity; equipment requiring good thermal conductivity and magnetostatic coils where high fatigue strength is required. Special applications include thermocouple sensor springs, reaction springs, claps, grid wires and side rods in vacuum tubes.
- Corrosion Resistance:** The corrosion resistance of Duranickel in all its forms is of the same order as that of nickel in a wide variety of media, including mineral and organic acids, alkalis, salts, potable and industrial waters, food products, organic compounds and oxidizing atmospheres at normal and elevated temperatures.
- Forms Fabricated:** Duranickel is supplied in most commonly used forms: rods, bars, sheets, wire, mesh, strip, sheet, wire and welding materials.
- Applications:** Duranickel is used in many applications where corrosion resistance, high hardness, and great strength are required. In the production of plastics, Duranickel is a standard material for dies, injection cylinders and extrusion screws. Duranickel springs, from both wire and strip, give excellent service. Instrument parts include diaphragms, bellows, reeders, finger wire claps, snap wire blades and grid wires and side rods in vacuum tubes.

#### FURTHER DATA AVAILABLE

A 32-page reference manual, Engineering Properties of Duranickel, Technical Bulletin T-12, contains all material engineering information. It is available, free, for your file. For complete metal problems, write directly to Inco's Technical Service, enclosing your questions.

THE INTERNATIONAL NICKEL COMPANY, INC.  
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**INCO**  
Nickel Alloys

MONEL • 70% MONEL • 70% MONEL • 70% MONEL  
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## EQUIPMENT



REFERENCE FLUID BURNS when subjected to hot pipe, but



SKYDROL DOESN'T BURN when subjected to the same test

## All Big DC-6 Fleets Go to Skydrol

Douglas reports cases where the fire-resistant fluid has sprayed into white-hot brakes without burning.

By George L. Chesler

American Airlines will convert the cabin supercharger drives of its 50 DC-6s to Skydrol hydraulic fluid next month, bringing all major DC-6 operations into the Skydrol camp.

Skydrol, announced in 1949, is the first fire-resistant hydraulic fluid to receive popular acceptance among commercial airlines, both U. S. and foreign. And many airlines are specifying the fluid for use in the entire hydraulic system of planes to be delivered DC-6s and -4s. Every DC-6B to be used as

domestic service will use Skydrol, as, too, will the manufacturers. Among other users are Panagra, Pan American World Airways, Shuf, Airways, Philippine Air Lines and United Air Lines.

Developed by major DC-6 operators and Monsanto Chemical Company, Skydrol was first used exclusively in a commercial aircraft in Capital Airlines' Super DC-6s. More than 75 tests and 25 flights were tested before the most desirable compound was found.

Low Water and Tear-Out significant improvements, other than its fire-resistant



## Silicone RUBBER PARTS

Only Silicone rubber parts retain their physical, chemical, and electrical properties at temperatures ranging from -110° to +300° F. In addition they feature excellent resistance to many chemicals, weathering, oxidation, moisture, ozone, and other factors that damage or destroy organic rubbers.

Today, Silicone parts are meeting the making demands of numerous applications in the automotive, aircraft, and other critical equipment manufacturing industries. Silicone Rubber Company produces a wide variety of precision parts from Silicone Rubber stock to meet individual specifications.

Write today for Catalog ST-101 for complete information.

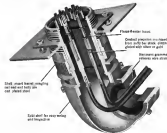
**STALWART RUBBER COMPANY**

1000 West 10th St., Tulsa, Okla.

| Mechanical Property Ranges of Duranickel |                  |         |            |          |
|--|------------------|---------|------------|----------|
| Type and Condition                       | Tensile Strength |         | Elongation |          |
|  | ksi              | psi     | in./in.    | per cent |
| Hot-rolled Bar                           | 10-130           | 30-35   | 50-30      | 75-25    |
| Hot-rolled, age-hardened                 | 110-210          | 115-195 | 30-15      | 30-45    |
| Cold-drawn, as-received                  | 110-180          | 100-135 | 30-15      | 30-35    |
| Cold-drawn, age-hardened                 | 170-210          | 155-175 | 20-15      | 30-45    |
| Strip                                    |                  |         |            |          |
| As-received                              | 110-115          | 10-9    | 50-30      | 75-25    |
| As-received, age-hardened                | 170-210          | 155-175 | 30-15      | 30-45    |
| Coil, as-received                        | 110-115          | 10-9    | 50-30      | 75-25    |
| Coil, age-hardened                       | 170-210          | 155-175 | 30-15      | 30-45    |
| Wire                                     |                  |         |            |          |
| As-received                              | 110-115          | 10-9    | 50-30      | 75-25    |
| As-received, age-hardened                | 170-210          | 155-175 | 30-15      | 30-45    |

Here's why those in the know

# —demand CANNON PLUGS



Here is another example of the care Cannon Electric takes in developing a standard form press head use. This is the Firewall Connector to prevent the spread of a possible aircraft engine fire through the fuselage of a wing section. Cannon Electric's Fire Wall Connector type with plastic insert and metal end flanges solder cap (S) will prevent an open fire of 500° F for 30 minutes. Electric connector not required for removal.



Cannon Electric AN Type Aircraft Firewall Connector are available in 14 different sizes to meet the needs of most aircraft. In stock. Please contact our Engineering Dept.

## CANNON ELECTRIC

Since 1919  
Los Angeles 31, California  
REPRESENTATIVES IN PRINCIPAL CITIES

In Canada and British Isles: see Cannon Electric Co. Ltd., Toronto & Ontario. West Coast: see Cannon Electric Co. Ltd., Vancouver & Seattle. 31 Day Street, Los Angeles 31, California.

## Skydrol Properties—Physical and Chemical

Appearance: Clear, transparent like kerosene.  
Color: Light green.  
Specific gravity: 0.815 at 60°F.  
Viscosity: 1.5 cSt at 100°F.  
Weight per gallon: 6.6 lb.  
Flash point: 100°F.  
Boiling point: 300°F.  
Freezing point: -50°F.  
Thermal stability: Excellent.  
Oxidation stability: Excellent.  
Corrosion: No corrosion to any metal.  
Solubility: Soluble in all hydrocarbons.  
Miscellaneous: No harmful fumes or odors.  
Safety: Non-toxic, non-flammable.

## Miscellaneous Data

Used for: Hydraulic fluid, engine oil, gear oil, etc.  
Advantages: High viscosity index, excellent oxidation stability, low pour point, etc.

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Since 1938...  
PLEXIGLAS Has Kept Pace

From its use as a landing light cover on the nose of a globe-circling plane, to a position as aviation's standard material for transparent enclosures and windows—PLEXIGLAS has kept pace with the industry's rapid growth.

In 1938, when Howard Hughes took off on his flight around the world, Plexiglas rode with him—shielding the landing light in the nose of his Lockheed 14. It was a dramatic use of a new material. Within less than two years, Rohm & Haas had developed methods of producing and forming large Plexiglas sheets for airplane enclosures, and helped make possible the improved aerodynamics of the planes of 1940-50.

On today's planes, too, Plexiglas is the standard transparent material. With good

heat resistance and stress-solvent stress resistance, Plexiglas II—meets rigorous Army-Navy specifications for current high-speed, high-altitude aircraft. And the present trend toward laminated enclosures on combat planes is possible because of the adaptability of Plexiglas to the necessary laminating and fabricating techniques.

For the planes of the future, Rohm & Haas laboratories are working to ease the standards of transparent plastics to even higher levels. Our technicians and service staff stand ready to help in any problem involving aviation applications of Plexiglas. Our Design and Fabrication manual should be in your hands. Send for it.



Plexiglas landing light cover on nose of Howard Hughes globe-circling Lockheed 14. Hughes' non-stopping flight broadened dramatically the field of aircraft design and performance.

Plexiglas is a registered Air Force II. Air Force II is a registered trademark of Rohm & Haas Company.  
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ROHM & HAAS  
COMPANY

PHILADELPHIA 22, PENNSYLVANIA

Representatives in principal foreign markets



## CONNECTORS by AMPHENOL

AMPHENOL has always been the leader in the development and perfection of electrical connectors for power, signal and control systems in aircraft and electronic equipment. Specify AMPHENOL—the quality name in electronics.

- A-N CONNECTORS
- SUBMERSION-PROOF CONNECTORS
- HEAVY DUTY POWER PLUGS
- AUDIO CONNECTORS
- TWO CONTACT CONNECTORS
- QUICK DISCONNECT CONNECTORS
- CARTRIDGE CONNECTORS
- POWER PLUGS
- BACK AND PANEL CONNECTORS
- MINIATURE CONNECTORS
- SEATBELT RELAY PLUGS
- RF CONNECTORS
- HEAVY DUTY RADIO CONNECTORS

present is addition to steady hydraulic pressure. Such installations are the leading gas down and wing flap retract cylinders. These cylinders have up quickly been solved, at least to date, through the use of a special Teflon back-up ring in place of the original leather back-up ring behind the "O" ring. Flaking performance on other parts of the airplane has apparently been satisfactory. And most often parts solve the part removal problem, the manufacturer hopes that the last "bug" have been deleted from Skyride hydraulic fluid.



### New Double Seat

Transport Equipment Co. has started deliveries of 420 double passenger seats to the Cessna L. Martin Co. for installation in TWAs 424-425.

Custom designed for TWA, the four back seats get out the final production version in 90 days from date of order. TECO points to these features:

- All-steel, chromate-plated tubular frame structure to meet TWA's 9G requirements.
- Wind-up type, lever-actuated recline mechanism.
- Windable plastic covering.
- Foam rubber cushions throughout.
- Adjustable foot rest and "footrest crotch" seat design.

### High-Altitude Brush

Brushes for aircraft motion and gas-control, specially engineered to provide a high standard of performance at high altitude, have been developed by the Penn Carbon Co., Inc., St. Marys, Pa. The new development, as the company explains it, "incorporates a combination of chemically treated and untreated brushes which are contained in such a way to get just the right amount of fine on the commutator to keep good operation at high altitude."

Obviously, the brush is made up of an impregnated section, and which is made two layers of untreated material by varying the thickness of the treated

# CROUSE-HINDS Type HSL

... the *economical* and *flexible*  
**high intensity**  
**airport runway light**



Crouse-Hinds Type HSL is approved under Specification L-820 "Fixed-Focus Uni-Directional High Intensity Runway Light". This system features both economy and flexibility. It is economical because only one of the 50 watt main beams is turned on in bad weather, and only a 30 watt light in clear weather. It is flexible since the high intensity beams can be individually adjusted for the most effective angle of use in one elevation for any particular airport and any season of the year. This adjustable feature produces the best visibility for differing atmospheric conditions. The fixture provides a main beam in only one direction, without the background beam resulting from the "back beam". After re-aligning the sealed beam optical system is back to 100% initial efficiency.

Crouse-Hinds offers all three types of high intensity runway lights. Each of the other two types have their individual advantages.

**Type HRC** is a controllable beam uni-directional high intensity runway light. It features a dual primary lens system on a cast aluminum frame, with a 500 watt 115 volt lamp mounted on a swivel socket. The main beam may be used on or turned out by remote control from the airport to provide the best service for optimum visibility conditions. The sub-beam is the backup of the main beam.

**Type HRL** is a fixed beam uni-directional high intensity runway light. It uses a 500 watt lamp and is provided with a means to ensure maximum visibility during and under adverse weather conditions. This system has the lowest maintenance cost and for airport airports in use is preferred for non-precision runways as well as instrument runways.

All three fixtures provide the required beam high intensity and power and all use a 3-stage high intensity control. They are designed for easy maintenance and have lead-sealing glassware, breakable couplings, disconnecting cable connectors, and standard steel terminalizer housings. They are completely built to Crouse-Hinds high standard of quality from the finest materials.



**CROUSE-HINDS COMPANY**  
Syracuse 4, N. Y.



**AIRPORT LIGHTING • FLOODLIGHTS • CONDUITS • TRAFFIC SIGNALS**



# SPS AIRCRAFT FASTENERS

## UNBRAKO

HAS INTERNAL WRENCHING AIRCRAFT BOLTS

CLOSE-TOLERANCE, HIGH STRENGTH ALUMINUM BOLTS—made to latest NAS Specification. Threads are fully formed by rolling after heat treatment, an equivalent UN-SEALOE feature. Full range of standard sizes.



HAS INTERNAL WRENCHING SELF-LOCKING NUTS

... meet all requirements of latest NAS Specification. Superior safety nuts. Sizes from 1/4" to 1 1/2"

## FLEXLOC

EXTERNAL WRENCHING NUTS

... incorporate the famous FLEXLOC self-locking principle and superior, all-metal construction. The exceptional strength of this construction has been proved by the success of FLEXLOC nuts in the aircraft industry.

Other outstanding advantages include:  
Maximum torque with minimum weight  
Approved under latest NAS Specifications  
Long bearing surface  
Positive self-locking—"won't shake loose!"  
Temperature range to +120° F.

No special tools needed—use standard 13-point socket or hex wrench. Designed for use in cramped quarters. Sizes from 1/4" to 1 1/2" NF Thread Series.  
Send for complete and informative...



ONE-PIECE SELF-LOCKING NUTS

The one-piece FLEXLOC is both a stop and a lock nut, due to its resilient segments which lock positively, even under extreme vibration. Design is normally uniform, within a few mils parallel. This "one" design type, hex and non-hex. Officially approved by many U. S. Dept., Service, etc., and CAA for aircraft use.



Write for further information on these UNBRAKO and FLEXLOC Products.

# SPS

STANDARD PRESSED STEEL CO.

JERKINTOWN 3, PENNSYLVANIA

the new differential is interchangeable with older (two-part) types. The unit is designed for accurate sensitivity as well as high accuracy, the company states. Backlash torque is as low as 1/300 in.-in. and static friction under load is less than five percent. Address: Ford Instrument Co., division of the Sperry Corp., Long Island City, N. Y.



## Tie-Down Fitting

A quick-acting tie-down fitting, designed to meet new loading requirements of the latest AN specifications covering this equipment, has been developed by Adams-Rite Mfg. Co.

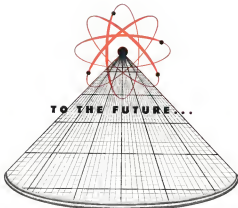
The fitting was developed in cooperation with West Coast surplus manufacturers, reports the company. In the steel is the standard AN7516 fitting.

As can be seen in the picture above, the device has a pair of pins which can be vertically clamped together by means of a collar to lock the clamp or letter to the floor. To release the joint, the collar is turned to unlock it and then slipped downward away from the pins. Address: 164 Chace Chase Dr., Glen Dale 4, Calif.

## ALSO ON THE MARKET

"Bunch-Tuf" terminals for electrical wiring are clamped and type that can be installed with one strand of tool. Built to have superior strength and outstanding qualities, connections can be used on solid or stranded wires ranging from No. 22 to 10 gage. Available from American Marine Products, Inc., 2300 Fox Run St., Haverhill, Pa.

"Strap-Lok" can be used for identifying and marking of entering parts or temporary marking of production line parts as they are moved from one operation to another. It is non-corrosive, non-staining and has good adherence to all metals, in addition to being resistant to petroleum-type cleaning fluids, oils and solvents. Address: Iron supplies, Organic Products Co., Irving, Tex.



## ELECTRONIC RESEARCH AND DEVELOPMENT

A long before the present reconnaissance program, our Electronics Division was engaged in research, development, and production for the United States and foreign governments. Air Associates is established as a major supplier of LF, VHF and UHF communications and navigation systems, landing systems, height error indicator systems, echo-ranging systems (including sonar), and special specialized electronic devices. Whether your requirements are immediate or for the future, our diversified experience can help in solving airborne, marine and ground electronic problems. Your inquiry to Telephones will receive prompt reply.



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TRENTON, NEW JERSEY



SERVING THE NATION - IN AVIATION



# STRETCH MANPOWER!



Get **MORE PRODUCTION**  
from **EVERY MAN**  
with **SIOUX** TOOLS



## SIOUX PERFECTED Aircraft Valve Seat Grinder

This highly developed, tested and proved grinder offers the modern, handy, time-saving method of refacing aircraft motor valve seats with accuracy . . . either cast, hardened steel, bronze or Stellite. The driving spindle is adjustable to any angle. Universal motor operates on AC or DC. Net weight 8½ lbs.

**F**or that extra capacity you need so much NOW — you need tools that increase the efficiency and productive capacity of your men . . . So go SIOUX all the way.

Sold only through authorized SIOUX Distributors

STANDARD THE  
ALBERTSON & CO., INC.



WORLD OVER  
SIOUX CITY, IOWA, U. S. A.

Other work, such as modification and overhaul, extends the workload to the end of the year at least. This is not surprising, according to a man readily admitted to handle a greater volume.

► **Graces**—The reason for Hewart's decision is to be heard in a long time down of Hewart's to relinquish any claim to his own activity and gradually to phase into becoming an industrialist.

The initial indication of Hewart's thinking, and probably the key factor leading up to his new activity, was when he leased a \$1 million hangar from Port of New York Authority at Teterboro late in 1949 and opened a round-the-clock, all-weather plane repair center catering to corporate aircraft and their users (American West Dec 5, 1949).

Here at Teterboro, where " . . . some creative plans pass through their own other place in the country," Hewart accumulated his corporate aircraft know-how. He had a photographic record made of the chain of every plane brought in and built up an extensive list of these airplanes, which appeared in his files and the techniques in making them up. And in the course of building up this library, he also made numerous contacts with other pilots.

► **Market**—Shedding When Hewart pulled the market potential for an East Coast conversion base, the figures looked promising. He found that about 70 percent of the U. S. industrial control was located between Chicago and Boston, with one-third of the 1,000 major businesses having New York offices. Of the other two-thirds, 40-50 percent had offices between New York and Chicago.

The outbreak of hostilities in Korea and among other business increased corporate apprehensions about a shortage of transportation between defense plants and Washington. This boosted the conversion plans. The U. S. business fleet of about 3,000 twin-engine craft has been growing at the rate of about 20 planes monthly, averaging approximately \$1.5 million of business weekly into corporate control.

Other factors made the field very very lucrative.

► **Military defense**—Manufacturing could be obtained that would fit well in with the necessary space and fabrication skills needed to rebuild large transports. Hewart saw a shortage of the necessary parts of production tooling needed and expects to have the equipment on hand in 90-120 days. His men are now busy up to the hilt.

The labor supply at Stratford is excellent, many former Chance Vought Aircraft employees being retained beyond when the plant was moved to Connecticut. The work has been let out to local shops for turning work out such as

materials in the CONVAIR B-36 most withstand temperatures from -100° to +500° F.

that's why **SILASTIC\***

is used wherever rubberlike properties are required at temperatures far above and below the limits of any organic rubber.



Silastic boots are used to increase the elasticity and to prevent corrosion and undue charring of the floor control system made by Exhaust Supply Corp. They retain their strength and flexibility at temperatures of -100° F.



Silastic gaskets reinforced with glass cloth are used to seal the rocker arm bearings on Ford and Willys "Wag Wagon" engines. They withstand hot oil at operating temperatures in the range of 420° F.



Silastic is used in seal boots for doors and the cover plates, doors and windows in aircraft bays, where flexibility and resistance are required at temperatures ranging from -100° to +140° F.



Silastic gaskets reinforced with glass cloth are used to seal the cabin heating and pressurizing systems at operating temperatures in the range of -70° to 400° F.

For more data on Silastic please see nearest branch office or write for New Silastic Facts sheet D-3.

\*U. S. PAT. 2,512,847

**DOW CORNING CORPORATION**  
MIDLAND, MICHIGAN

Atlanta, Chicago, Cleveland, Dallas, Los Angeles, New York, Washington, D. C.  
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# ALERT!

## Getaway Fast!



• When the red alert sounds there's no compromise for dependability, performance, and quick starts! That's why the light weight GLA high energy condenser discharge system is specified for the Air Force's fighting jets. These ignition systems combine advanced electronic development with unique space and weight saving design—such system is engineered to deliver maximum performance through the widest possible range of operating conditions.

Solving complex ignition problems and producing the equipment is our business. Our engineering department invites your inquiry. May we hear from you?



plating, stamping, machining and so on.

• **Airbus** business has reacted to the extent that many airlines are sending out their modification and overhaul work. Milled Industries is negotiating with their unions on this topic.

• **Cometone** Products—Cometone stays at Constantin is on a production-line basis, which is facilitated by Elwell's policy of purchasing and stocking standard of the popular types of large transports—then selling these and the conversion as a package. In this way, with a line already assigned to work on a number of planes—five are now going through—he can continuously add new work into it and arrange working schedule and procurement so as to permit strict cost analysis.

When the airplane is put on the line, it is lowered onto wooden boxes which maintain the craft in a level position, with a clearance of 20 in. from saddle to floor. This low, level placement makes working conditions inside the plane easier, and overcomes the need for cluttering up the hangar with numerous work stands.

Only the base fastings and center section remain in the hangar in the early stages, whereas, rudder, flaps, inlets, etc., are all furnished into their respective shops for remodeling. New ducting, flooring, ballbeats and so on are designed and fabricated. Engine and pump work is turned out.

• **Cometone Package**—The conversion package is built around a "standard" Milled design covering the plane's structure and equipment placement. The company is very weight-conscious and has worked out numerous engineering changes in the DC-3 to obtain the usual position of plane interiors.

One of these modifications is to build up a new flooring of U.S. plywood honeycomb panels, and to move 190 lb over the previous DC-3 floor and base support strength characteristics. This is particularly important in view of varied and unusual loading and storage arrangements called for.

Other standard company features are storage doors with built-in steps, and a larger baggage hatch than is standard.

No little part of the Cometone operation entails language of corporate plans—there are 14 executive transport based there now, and the inevitable location—only 20 min. flight time by Navion (for which Elwell is a distributor) from Teterboro makes it handy for executives.

Elwell's known industrial language made interesting the operation that, with all the experience Milled Industries is gaining in the executive aircraft field, plus the fabrication know-how, excellent labor supply and shipping facilities, he may be taking a jump for future air-designing, building and selling his own executive plane design.



## MORE PRODUCTION!

*new Aeroproducts plant will double capacity!*



Aeroproducts' large expansion program is on its way. Ground has been broken for the new plant and by the end of this year, present production capacity will be more than doubled!

This rapid expansion of facilities will more than enable Aeroproducts to meet Air Force demands for Aeroproducts on the great Fairchild C-119... more than meet the Navy's needs for turbine propulsion on the Douglas A1D, the Consolidated Valiant R3V and others. For Aeroproducts is planning for tomorrow.

... looking forward to a constantly increasing demand for its products. And whatever the future may hold, Aeroproducts will be ready—fully prepared to build, produce, and ship new aircraft, engines, and transports of our armed forces.

Yes, Aeroproducts, backed by the full facilities of General Motors, is ready to meet the demands of today... and is well on the way to meeting the accelerated demands tomorrow may bring.



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GENERAL MOTORS CORPORATION  
DETROIT, MICH.

*Building for today  
Designing for tomorrow*



# Aeroproducts



## Acclaimed by 400,000 Ocean Travelers!

In the two short years since the Boeing Stratocruiser made its first commercial passenger flight, it has become the undisputed choice of passengers on over-ocean travel.

Today the great twin-deck super-transport flies smoothly right in San Francisco, London, Honolulu and Tokyo as in New York, Seattle or Los Angeles.

In operation on four major airlines, Stratocruisers have made 15,500 trips, carried 880,000 passengers, and flown

more than 45,000,000 miles. On over-ocean routes alone, they have transported nearly 600,000 people!

The tremendous popularity of the Stratocruiser is easy to explain. More spacious than any competing aircraft, it offers ample room for passengers to move about in aisle-cubes or lower-deck lounge. The finest altitude conditioning is in every transport perch; smooth, high-level flight with complete control. And Boeing-designed wing, lighting and

dressing-room lockers add to the pleasure of Stratocruiser travel.

No other plane-builder can match Boeing's low-engine-mount experience, proved in the performance of the early transoceanic Clipper flying boats and Stratobuses, the B-17 Flying Fortress, B-29 and B-50 Superforts and C-97 Stratofreighters. People know the integrity of Boeing research, design and engineering. They like to fly in Boeing built aircraft.

**BOEING**  
STRATOCRUISER

\* Mechanical flight, structural, civil engineer and physicist Boeing has completed drawings for jet! Note Engineering Personnel, Boeing Building Company, Seattle 18, Washington

## AIR TRANSPORT

### Operating Characteristics: Jet vs. Piston Transport

#### Profits and Utilization

|  | JET L-1011    | PISTON DC-6   |
|--|---------------|---------------|
| Miles flown per year                     | 10,000,000    | 10,000,000    |
| Days flown per year                      | 250           | 250           |
| Days utilization                         | 100%          | 100%          |
| Load factor, seats filled                | 80%           | 80%           |
| Number of trips per year                 | 40,000        | 40,000        |
| Passenger miles per flight               | 1,000,000     | 1,000,000     |
| Passenger load factor                    | 80%           | 80%           |
| Passenger miles per year                 | 1,000,000,000 | 1,000,000,000 |
| Passenger revenue per year (1¢ per mile) | \$10,000,000  | \$10,000,000  |
| Operating expenses per year              | \$8,000,000   | \$8,000,000   |
| Profit per year                          | \$2,000,000   | \$2,000,000   |
| Profit per operating hour                | \$2,000       | \$2,000       |

#### Cost per Seat Mile

|           | SEAT | SEAT  | SEAT  | SEAT  |
|-----------|------|-------|-------|-------|
|           | 100  | 1,000 | 1,000 | 1,000 |
| 14 L-1011 | 1.00 | 1.00  | 1.00  | 1.00  |
| 14 DC-6   | 1.00 | 1.00  | 1.00  | 1.00  |
| 14 L-1011 | 1.00 | 1.00  | 1.00  | 1.00  |
| 14 DC-6   | 1.00 | 1.00  | 1.00  | 1.00  |
| 14 L-1011 | 1.00 | 1.00  | 1.00  | 1.00  |
| 14 DC-6   | 1.00 | 1.00  | 1.00  | 1.00  |
| 14 L-1011 | 1.00 | 1.00  | 1.00  | 1.00  |
| 14 DC-6   | 1.00 | 1.00  | 1.00  | 1.00  |
| 14 L-1011 | 1.00 | 1.00  | 1.00  | 1.00  |
| 14 DC-6   | 1.00 | 1.00  | 1.00  | 1.00  |

#### Traffic Pattern Speeds

(Minimum landing weight)

#### Runway Distance

|                  | JET L-1011   | PISTON DC-6  |
|------------------|--------------|--------------|
| Takeoff distance | 1,000 ft.    | 1,000 ft.    |
| Landing distance | 1,000 ft.    | 1,000 ft.    |
| Takeoff weight   | 100,000 lbs. | 100,000 lbs. |
| Landing weight   | 100,000 lbs. | 100,000 lbs. |

#### Scheduled Flight Times

(Minimum landing weight)

\*Partial schedule comparison for line of flight on jet day.  
Based on 100,000 lbs. weight. Jet weight 100,000 lbs. Piston weight 100,000 lbs.

## Airlines Told How Jets Can Make Money

Greater speed means more seat miles flown per year; this results in higher income, decreased plane fleet.

A switch now from piston-engine to jet transport means will not cost and bring in additional revenue for long haul airlines, Lockheed Aircraft Corp. says.

And Lockheed backs up its statement with detailed figures in a brochure on the proposed jet L-1011, which it has sent to American Airlines, Trans World Airlines, Pan American World Airways, and others. "To give summary to the sales talk," Lockheed says the new transport, despite its high-speed potential, will be able to operate in today's traffic pattern.

Five Years to Delivery—Lockheed claims a fleet of 14 B-44-passenger L-1011s would replace 25 DC-6s on Conquest air route service by 1956 (five years from order to delivery on jet L-1011 order). And the 14 L-1011s would carry 150,000,000 operating profit for American Airlines on regular-line passenger service where the DC-6s would make \$6,000,000 a year.

There is a trade apparent as short as 500 miles, Lockheed estimates its fast jet transport design would carry the present-day DC-6 on total out-of-pocket and indirect. At a range of 1,000 miles, the jet would have a definite cost advantage—1.5¢ each a seat mile compared to 1.8¢ each for the DC-6, Lockheed estimates in its brochure to American Airlines.

Here is how Lockheed figures it: "To prove that the same aircraft can be used on both routes and planes by American Airlines DC-6s can be replaced by the L-1011 with about half the number of planes and with higher operating profits."

The figures show 40 mph faster to block speed means for the jet against 260 for the DC-6, the 14 jets would fly the same number of plane miles a year as 25 DC-6s—18.4 million plane miles. With 14 jets available, the jets would land 1,100 million available seat miles where the DC-6s would carry 950 million. At 1.5¢ each a revenue passenger mile, 16,000 seat load factor, the jets would gross \$16,000,000 where the DC-6s would gross only \$15,000,000 at 65 percent load factor.

Operating cost—direct and indirect—would be \$15,000,000 for the jets compared with \$25,000,000 for the DC-6s. That the jets would gross \$16,000,000 more revenue and cost only \$15,000,000 more to operate. So operating profits on the same schedule would be \$1,000,000 better on the jet—\$10,000,000 passenger operating profit on 14 jets.

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agreed. \$6,700,000 on 25 DC-6s, according to Lockheed analysis of AA's long-haul routes.

Who'll Be First?—Despite Lockheed's last-landing sales pitch to Americans, however, say Trans World as Pan Am can sell, possibly be the first U.S. airline to buy jets. Trans-Atlantic competition expected from British's jet transports comes as later would force American lines to go jet, they say.

The question is when—two years or more? Lockheed estimates it will take six years from the first order to produce a fleet of L-1011s. That is because the manufacturers will not build a prototype without an order. So the airlines must go through both preliminary engineering and production engineering phases before starting production. And the L-1011 design calls for turbo-propellers of 12,000 lbs. static thrust each. No such engine is operational yet, though some are in development stage and should be ready by the time the L-1011 aircraft could be ready.

British Progress—The British are a long way from large-scale jet operation on the competitive Trans-Atlantic route. Overseas Airlines has 14 de Havilland Comets on order. But only four are large enough range to span the Atlantic on scheduled service. There are the four Mark III jets will fly Kallio-Royce Avons against it.



## for temperature testing in the laboratory or in the plane...

Constructed with the same care as our aircraft temperature indicators, these pyrometers bring "aircraft quality" to the test engineer.



MODEL 1875, left above, has been used extensively by leading engine manufacturers for test testing on the "Pittsburgh" engine, an engine production engine. Used in temperature testing on the "Pittsburgh" engine, it has been found that the Lewis 1875 is the most reliable pyrometer available.



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STANDARD RANGES—All Models  
TEMPERATURE RANGE—100, 200, 300, 400, 500, 600, 700, 800, 900, 1000, 1100, 1200, 1300, 1400, 1500, 1600, 1700, 1800, 1900, 2000, 2100, 2200, 2300, 2400, 2500, 2600, 2700, 2800, 2900, 3000, 3100, 3200, 3300, 3400, 3500, 3600, 3700, 3800, 3900, 4000, 4100, 4200, 4300, 4400, 4500, 4600, 4700, 4800, 4900, 5000, 5100, 5200, 5300, 5400, 5500, 5600, 5700, 5800, 5900, 6000, 6100, 6200, 6300, 6400, 6500, 6600, 6700, 6800, 6900, 7000, 7100, 7200, 7300, 7400, 7500, 7600, 7700, 7800, 7900, 8000, 8100, 8200, 8300, 8400, 8500, 8600, 8700, 8800, 8900, 9000, 9100, 9200, 9300, 9400, 9500, 9600, 9700, 9800, 9900, 10000, 10100, 10200, 10300, 10400, 10500, 10600, 10700, 10800, 10900, 11000, 11100, 11200, 11300, 11400, 11500, 11600, 11700, 11800, 11900, 12000, 12100, 12200, 12300, 12400, 12500, 12600, 12700, 12800, 12900, 13000, 13100, 13200, 13300, 13400, 13500, 13600, 13700, 13800, 13900, 14000, 14100, 14200, 14300, 14400, 14500, 14600, 14700, 14800, 14900, 15000, 15100, 15200, 15300, 15400, 15500, 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## SIDELIGHTS

(Continued from page 1)

### State Dept. Projects

Chief State Dept. air activities vice pres (1) mobilization plans among other duties, (2) negotiating an air transport agreement with The Netherlands, (3) preparing for the NATO assembly in Washington, (4) administration of projects in the New Zealand agreement, (5) trying to get Venezuela to enter an bilateral air transport agreement with the U.S.

### Army Steers Clear of USAF

Army Field Force is insisting on CAA certification of any helicopter before it will place in order for the craft. AAF has no recognized engineering establishment comparable to that of USAF, unless not its division on USAF's Wright Field engineering support for evidence of the copiers' workmanship and performance. Finally, Army doesn't think USAF knows what craft jump means.

### Storage for Old Admirals?

Some critics have long expressed that claims of Navy's "Golden Rule" might have some effect on Navy aviation, particularly because of similarity in name to USAF's powerful Senior Officers Board. The General Board was set up in 1960 to advise the Secretary of the Navy on conduct of the Spanish American War. Later it became a formally organized group to advise staff on (a) the Secretary on matters concerning military characteristics of ships and after 1970, to some extent, aircraft. It was considered to be a staff advisory group because of its lack of authority, plus the fact that its personnel were assigned, with no other duty. During World War II it reflected some and was added only to a staff of the navy of one spokesman. "A composed place in three old admirals before retirement."

### Where's the X-2P

Program on the X-2P, being built by Bell Aircraft Corp., has been down since last spring, but the plane still is expected to fly in 1970. Or so NASA's Hugh Dryden told critics in appropriate language.

### Washington Talk

They do still say that W. Stuart Symington has his eye on the post of Secretary of Defense, if and when Marshall leaves. But he won't have clear sailing, apparently, because West Coast senators are still alive over the mutual distrust program. Symington is not at the USAF and NSASU planning. Meanwhile, "Washington Talk" Board's the only name mentioned was mentioned in increase in Navy Secretary Francis Matthews. Matthews is being sought by Truman to take over the department paid in interest and many Navy people hope he goes. Matthews has not fought vigorously for Navy in Washington. — Ann Adams

Recent Secretary's "everything is fine with the Administration" testimony before the Senate reinforced the impact he will become the new chairman of the Joint Chiefs of Staff when Gen. Bradley's term expires in August, although it's understood the First Deputy would not accept if Bradley stays on. Another people remember is 1970, when "Building America" in general of the Navy included in Congress writing a stipulation was also entered into leaving the transfer of Naval plans to the Navy Secretary who sought to get a review of the Navy during the past year including light again challenged the Navy high command to vigorously supporting the plan. Secretary and USAF's Lt. Gen. Louis Nimitz said this could be being among the chief authors of the Uniform Act.

### More School Contracts Seen

Approval of DMT legislation has cleared way for congressional consideration of reserve and ROTC bills that will probably give a significant role to technical training and reserve units. The reserve units, Reserve Engineers, now being drafted by Defense Dept., is first on the agenda. Approved Training Groups recommends that such legislation include reserve flight and technical training. But if some drafted the new law will provide this ROTC legislation, already closed by Defense, and continued by Congress. Several bills (H.R. 1000, H.R. 1001, H.R. 1002, H.R. 1003, H.R. 1004, H.R. 1005, H.R. 1006, H.R. 1007, H.R. 1008, H.R. 1009, H.R. 1010, H.R. 1011, H.R. 1012, H.R. 1013, H.R. 1014, H.R. 1015, H.R. 1016, H.R. 1017, H.R. 1018, H.R. 1019, H.R. 1020, H.R. 1021, H.R. 1022, H.R. 1023, H.R. 1024, H.R. 1025, H.R. 1026, H.R. 1027, H.R. 1028, H.R. 1029, H.R. 1030, H.R. 1031, H.R. 1032, H.R. 1033, H.R. 1034, H.R. 1035, H.R. 1036, H.R. 1037, H.R. 1038, H.R. 1039, H.R. 1040, H.R. 1041, H.R. 1042, H.R. 1043, H.R. 1044, H.R. 1045, H.R. 1046, H.R. 1047, H.R. 1048, H.R. 1049, H.R. 1050, H.R. 1051, H.R. 1052, H.R. 1053, H.R. 1054, H.R. 1055, H.R. 1056, H.R. 1057, H.R. 1058, H.R. 1059, H.R. 1060, H.R. 1061, H.R. 1062, H.R. 1063, H.R. 1064, H.R. 1065, H.R. 1066, H.R. 1067, H.R. 1068, H.R. 1069, H.R. 1070, H.R. 1071, H.R. 1072, H.R. 1073, H.R. 1074, H.R. 1075, H.R. 1076, H.R. 1077, H.R. 1078, H.R. 1079, H.R. 1080, H.R. 1081, H.R. 1082, H.R. 1083, H.R. 1084, H.R. 1085, H.R. 1086, H.R. 1087, H.R. 1088, H.R. 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### The Presidential Board's Pilot Decision

(Mr. Robins, an American Airlines pilot and a member of the pilots' AFL union, has been given complete freedom by American West in his expression below as a controversial subject. The opinions he expresses are his own.—B.J.W.)

The Presidential Emergency Board wanted to *lose* the dispute between American Airlines and its pilots delivered its decision May 24. The report amounts to a stinging blow to all airline pilots for the case was intended to set many precedents. Of 23 arguments made between the airline and the pilots only one proposal of ALPA was accepted. All others were denied, or modified to approximately 50 percent of the pilots' request.

Digital tools meant the establishment of new rules on work schedules. All requests for their three-months leave on duty, determination of number of orders to be flown per month, and a relationship between hours on duty and pay-hours—were denied. The Board did recommend a pay raise for co-pilots, but on a scale which still places the 3rd in command at a place below the flight engineer, who is 1st in command. Other items, such as leave, sickness, deadweight pay, starting pay, rules on conditions of new equipment, landing pay and certain compensation provisions and benefits were denied or weighted heavily in favor of the carrier.

**Superstitions.** The findings of the Board will have some repercussions on the Copart, TWA, United and Eastern, as well as others, we are asking, and we are asking, for example, the Eastern to make a study of the superstitions of its employees. In effect, the President has indicated that on all airlines there is a superstition that he is not interested in their problems. This superstition is clearly defined in that which existed by so long on the ground, and which caused the left-winged staff. In both cases decisions were headed down which were known to be extremely unacceptable to the employees and the outcome is the airline that say to be the same as that on the ground.

The issue of dead-end pay was clarified by the Board's decision. It is considered free to exit transportation contracts, including easy dismissal. It is known as a promotion clause. In practice, however, dead-end pay is required by the union to pay for it. Obviously, when an employee dead-ends, it is of course a request. A broken pay has proven to have the effect of reducing the number of migrants. When the Pacific Northwest resumed operations last winter, after the full settlement, the Board ruled that dead-end pay was not required to be paid to the Pacific because they did not have to be paid for it. However, the Board ruled that dead-end pay for American's pilots.

In nearly all types of industry, it is commonplace for an employee to be guaranteed some portion of a day's pay when he is required to report for duty. At present an airline pilot may be called for an extra section, which may be canceled before departure, and the pilot will receive no pay for reporting to work. Railroad personnel usually are guaranteed one half day's pay. The Board took a dim view of this practice for airline pilots although the situations are identical.

The pilots had also requested a monthly maximum time on duty. The recommendations were that 16 hours a day be permitted (with 16 as an emergency) and that time off consist of 4 periods of 45 hours each per month. Thus by the Board's own figures a pilot may conceivably be on duty for 368 hours in one month and be paid for only \$60!

The Board also commented on pilots in Mexico flying 100 hours a month and British pilots 125. They felt RF was plainly good for U. S. pilots. ALPA points out, however, that all U. S. pilots are better off than foreign. If it is intended that pilots revert to the standards of other countries then perhaps living conditions will also slide.

► **Flying Kitchen?**—A possible reason for the adverse decision for the pilots may be found in the Royal's contempt of the pilot's job to that of a housewife in a modern kitchen. All that is necessary, the Royal felt, is to push buttons and things happen. To anyone familiar with the complexities of modern airplanes the thesis that they are flown by push buttons, and flown more easily than planes of 10 to 15 years ago, will sound strange indeed.

In short, the findings of this Presidential Board, of a supposedly pro-labor government, are so obviously anti-labor that many people are wondering if outside influence was exerted.

The evidence now indicates that the pilots will not accept this report. No further action, short of settlement of the dispute, is possible by either party until June 24, the 10-day "cooling off" period. At that time it may be possible to ascertain better the extent to which this decision will affect the air transportation industry.

- J. C. Fothergill

## WHAT'S NEW

## New Books

The Physical Nature of Flight, by Ray Holland, Jr. Published by W. W. Norton & Co., Inc., New York. \$4.00.  
This is a real book find.

The author, an aeronautical engineer, researcher, consultant, and former Lockheed head of aerodynamics, windtunnel and flight test, has tackled a subject that usually has been handled in a "new car under" or otherwise dull fashion and has come up with a completely adequate treatment—a presentation that is both an interest and a surprise.

The presentation simplifies for the layman the physical principles of light. It should be an excellent primer for the astronomical student. And it will be fine reading for the busy amateur as he comes into season, who wants to brush up on fundamentals. Even thoroughly grounded cognoscenti in the industry should find it worthwhile as an example of how effectively content can be presented.

The book is neither juvenile nor technically slanted. It finds a middle ground and depicts a scene of what normally is considered complex facts in an easily readable work, replete with effective physiology, anecdotes and statistics. The illustrations are so simple and straightforward that they need but a glance to convey a wealth of facts.

The book works its way from elementary data through the various features and aspects of light, tying the simple with the difficult and casting them into a down-to-earth discussion. —*BS*

### New Addresses

The Agricultural division of Minneapolis-Honeywell Regulator Co. is now located at 7080 Ridgway Rd., Minneapolis 18.

Adel division of General Metals Corp. has moved to new offices in the Holman Building, 120 W. Second St., Denver 2. Donald E. Flinn continues as Adel's Denver representative.

## Telling the Market

**Bolts** 5194, covering light-duty flexible shafts and couplings having no inert applications is available from Krypton Silc Co., 346 Prospect Ave., Binghamton, N. Y. A job-oriented catalog of marking devices designed to simplify their selection is available from New Method Stamps, Inc., 147 W. Cassan, Detroit 17.

## ADVERTISERS IN THIS ISSUE

AVIATION WEEK—JUNE 18, 1953



**LEDEX**  
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## EDITORIAL

## Pilots, Painters & Safety

The Presidential Emergency Board reporting on the American Airlines pilot dispute notes glibly that piloting airplanes is no longer a particularly hazardous job.

It lists some comparative costs premiums per \$1,000 of ordinary life insurance as quoted by a leading life insurance company.

|                                |        |
|--------------------------------|--------|
| Airline pilot                  | \$2.90 |
| House painter                  | 2.50   |
| Bridge painter                 | 5.00   |
| Railroad detectives & watchmen | 5.00   |

Mortality rate per thousand domestic airline pilots ranged between 16 and 26 in the 1993-1996 period. It was 1.5 in 1946 and 1.1 in 1949.

These figures tell an impressive story of the remarkable improvement in online safety in less than 20 years.

Everyone connected with aviation has a right to some share of credit for this accomplishment. But the quest for a perfect safety record—as impossible of attainment as it may appear to be—must always be sought vigorously, unrelentingly.

And the similarity between the immense computer's ratings of the relative hazards of airline pilots, painters, dentists and watchmen should be considered in the light of the great accomplishment it is, and never as fodder for any kind of propaganda to undermine the value of the trained and skilled pilot in the modern airline.

These aviation safety figures were not achieved by house-painter piloting, and they would start disintegrating instantly if we installed house-painter piloting. With all due respect to painters, decorators and watchmen, who perform honorable and much needed missions in modern society, we want some of their ilk up in the front office of any airline we board.

That goes for the wondrous electronic age part shared of us, too, when everything will whir automatically—till one of the widgets blows a tube. Please, we want no printers or watchtrains to take over at that crucial moment.

## Washington Is Like This

Here is the latest incredible installment on our continued story about government contract bids, and how first you see them, then you don't. Today's says you do. Even more so than our May 18 installment said.

The Manthons Board in all its haste staffers changed down the bid on dollar figures for Air Force and other government contracts with industry. Even on things like dish cloths and lawn mowers. Publicity for exact amounts of such—and other—government purchases was perilous to the national security, according to Manthons' milieu.

So AVIATION WEEK and other publications stopped printing contracts and a lot of newspapers stopped getting this information about how their money was being spent. Especially, though, the Administration in Washington.

was spared the embarrassment of showing how low contracts were going to small business. This was the real purpose of the iron curtain.

Now we learn that all this time the Wage & Hour and Public Contracts Divisions of the Labor Department were going along as they have for these many years, micrographing and distributing to staff lists each month the contracts awarded under the Walsh-Healey Act. This means a very high percentage of government contracts.

Words were full on, as we stood by to watch the Mentions Board wake up and try to circumvent the Walsh-Healey Act. That law requires due publicity for such information.

### An Old & Tragic Story

A tragic illustration of the danger of starting at six shows appeared in newspapers—probably hundreds of them—some weeks ago. As published in the New York Times, it read:

## STUNTING PLANE CRASHES, 2 DIE

**Rockaway, Ore., April 29 (UP)**—Two men died today when a straining lightplane plunged into the sea off the beach vacation area as hundreds of Tillamook County Centennial celebrants looked on. Those killed were Adie Johnson, 32, and Marvin Fite, 36, both of Tillamook.

Shooting anyone is foolish for the participants, reprehensible in its danger to others, thoughtless of the reputations to sustain. It does not make an good-better you may look at it.

Aviation Week will continue to point out this historic practice descending from an order on white aviation was in its infancy, without any sense of impossibility, appealing to the mobility that brought out thousands to the ancient Colosseum.

We invite you readers to send us all reports of such needless fatalities and casualties which may occur in your area.

## Learn From the Rails!

So comes June 1 and the Pullman Co. drops a 15-percent increase on all its rates. Here it is reaping from chronic customer-lack, so it takes fares that will bring even fewer customers. It forgets about offering better service or attracting new business with special fares, in the good old American tradition of customerism.

We hope the airlines are intelligent enough to capitalize on Pullman's shortcomings and not get cocky over all their increased business. If they do raise rates, they'll be playing directly into the hands of the non-stocks—who have just won a permanent court injunction to prevent CAA's order restricting them to three flights a month.

<sup>a</sup>Robert H. Wood.

# OPERATION POSTAGE STAMP!

## Carcom Makes Navy Drop On Korean Coast

C-119's Free Drop  
Manila Rope and  
Cable From 300' Onto  
Postage Stamp Beach

HEADQUARTERS, PLAF  
COMBAT CARGO COM-  
MAND, AIRLIFT BASE,  
JAPAN, (AT)... is one of  
the most successful operations  
of the Korean campaign, using  
aircraft to carry PLAF combat  
cargo. Commanded as dropped  
emergency supplies to U & N  
on the northeast coast of Korea.

314th Combat Cargo Center  
Wing, flying to close formation  
the low altitude of 500 feet, he  
dropped 21,800 pounds of ex-  
trick rope and steel cable on  
a narrow beach in the area of  
some twenty miles north of  
North Korean port city  
Haiphong.

The light-blue paper



Forrester, Evans, Dillard, Mueller and Sharon, *Public Relations*, 1994, 144

# Take a look at the CONVAIR B-36...



RB-36D version of famed intercontinental bomber

## ...and see what makes it potent

**T**HE Convair B-36 has speed, maneuverability, firepower, accuracy, eyes that see in the dark, and power to get to extreme altitudes. Here's how it gets these qualities.

A special General Electric turbosupercharger system soups up the piston engines to give normal rated horsepower up to extreme altitudes. Four G-E J47 jets supply more than 20,000 pounds of additional thrust.

A G-E remote control armament system locates the gunner in a pressurized compartment away from his guns. G-E fire control radar tracks attacking fighters to supply aiming information. G-E electric com-

puters make the defensive counterpunching faster and more accurate.

Ignition transformers on the engines, tiny fractional horsepower motors in the propellers, governors on the power system, position indicators, voltmeters, ammeters—all do their part in keeping the big bomber strong.

Like any artist proud of his work, General Electric places its signature on these products. For more information on aircraft equipment that wears this badge of dependability, telephone your nearest G-E aviation specialist or write Apparatus Department, General Electric Company, Schenectady 5, New York.

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